Ontario

ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: XXII

DATE: Monday, July 4th, 1988

BEFORE:

M.I. JEFFERY, Q.C., Chairman

E. MARTEL, Member

A. KOVEN, Member

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EA-87-02

HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental Assessment for Timber Management on Crown Lands in Ontario;

- and -

IN THE MATTER of an Order-in-Council (O.C. 2449/87) authorizing the Environmental Assessment Board to administer a funding program, in connection with the environmental assessment hearing with respect to the Timber Management Class Environmental Assessment, and to distribute funds to qualified participants.

Hearing held at the Ramada Prince Arthur Hotel, 17 North Cumberland St., Thunder Bay, Ontario, on Monday, July 4th, 1988, commencing at 1:00 p.m.

VOLUME XXII

BEFORE:

MR. MICHAEL I. JEFFERY, Q.C.	Chairman
MR. ELIE MARTEL	Member
MRS. ANNE KOVEN	Member

A P P E A R A N C E S

MR. V. FREIDIN, Q.C.) MS. C. BLASTORAH) MS. K. MURPHY)	MINISTRY OF NATURAL RESOURCES
MR. B. CAMPBELL) MS. J. SEABORN)	MINISTRY OF ENVIRONMENT
MR. R. TUER, Q.C.) MR. R. COSMAN) MS. E. CRONK) MR. P.R. CASSIDY)	ONTARIO FOREST INDUSTRY ASSOCIATION and ONTARIO LUMBER MANUFACTURERS' ASSOCIATION
MR. J. WILLIAMS, Q.C.	ONTARIO FEDERATION OF ANGLERS & HUNTERS
MR. D. HUNTER	NISHNAWBE-ASKI NATION and WINDIGO TRIBAL COUNCIL
MR. J.F. CASTRILLI) MS. M. SWENARCHUK) MR. R. LINDGREN)	FORESTS FOR TOMORROW
MR. P. SANFORD) MS. L. NICHOLLS) MR. D. WOOD)	KIMBERLY-CLARK OF CANADA LIMITED and SPRUCE FALLS POWER & PAPER COMPANY
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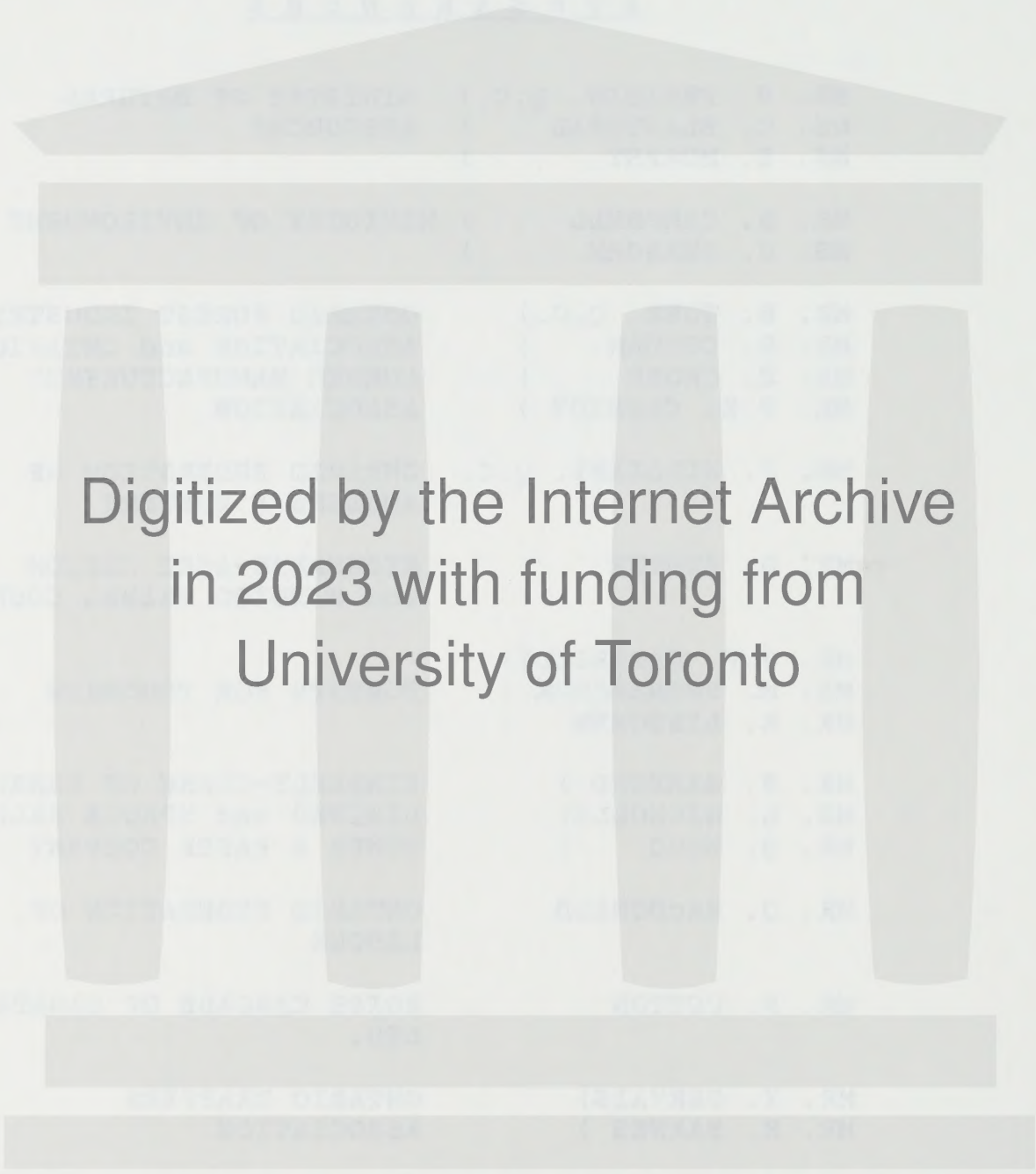
MR. Y. GERVAIS) MR. R. BARNES)	ONTARIO TRAPPERS ASSOCIATION
MR. R. EDWARDS) MR. B. McKERCHER)	NORTHERN ONTARIO TOURIST OUTFITTERS ASSOCIATION
MR. L. GREENSPOON) MS. B. LLOYD)	NORTHWATCH



APPEARANCES: (Cont'd)

MR. J.W. ERICKSON, Q.C.) MR. B. BABCOCK)	RED LAKE-EAR FALLS JOINT MUNICIPAL COMMITTEE
MR. D. SCOTT) MR. J.S. TAYLOR)	NORTHWESTERN ONTARIO ASSOCIATED CHAMBERS OF COMMERCE
MR. J.W. HARBELL) MR. S.M. MAKUCH)	GREAT LAKES FOREST PRODUCTS
MR. J. EBBS	ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
MR. D. KING	VENTURE TOURISM ASSOCIATION OF ONTARIO
MR. D. COLBORNE	GRAND COUNCIL TREATY #3
MR. R. REILLY	ONTARIO METIS & ABORIGINAL ASSOCIATION
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MR. G.J. KINLIN	DEPARTMENT OF JUSTICE
MR. S.J. STEPINAC	MINISTRY OF NORTHERN DEVELOPMENT & MINES
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MR. P. ODORIZZI	BEARDMORE-LAKE NIPIGON WATCHDOG SOCIETY
MR. R.L. AXFORD	CANADIAN ASSOCIATION OF SINGLE INDUSTRY TOWNS
MR. M.O. EDWARDS	FORT FRANCES CHAMBER OF COMMERCE
MR. P.D. McCUTCHEON	GEORGE NIXON

APPEARANCES: (Cont'd)

MR. C. BRUNETTA	NORTHWESTERN ONTARIO TOURISM ASSOCIATION

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---Upon commencing at 1:00 p.m.

THE CHAIRMAN: Thank you, ladies and gentlemen. Please be seated.

Mr. Freidin, before we commence today, the Board indicated that we would outline the areas with respect to the site visit including the possible activities that the Board would like to have considered with respect to this visit. We realize that some of these activities or some of these locations may not be possible within the time constraints that we have and we have not chosen these in any particular order, so feel free when designing itinerary to do what you feel is the most economic and sensible routing to choose.

And if you find that we have just included too much in various areas, then I would like you to get back to Mr. Mander with some indication that we cannot include everything and then we will try and priorize some of the things that we have chosen if they all cannot be included.

The list that I am going to read off to you also includes an indication whether it is going to be, in our view, just a flyby or whether we would like a stop included and, once again, we have no idea whether at some of these locations it is possible to stop, in terms of landing. If that is not possible,

then just indicate it and we will do it with the flyby Obviously, the stops take more time and it may be that we have included too many stops in this draft exercise.

Okay. Starting off with the various areas. We would like to go to the Ear Falls area and see the bedrock clear-cut sites north of Ear Falls, the Great Lakes FMA area, and the jack pine plantations that are in that area. And we would like to stop at both the plantations and the bedrock clear-cut areas, if possible.

We would like to flyby the west of Vermilion Bay area where there is evidently an unsuccessful regeneration and also clear-cutting to the shoreline.

Another area that we would like to see in a flyby with a possible stop, if it can be arranged, is the Fluke Lake area which is 20 miles north of Vermilion Bay where there is evidently some extensive silting occurring. Again, it may be a small river or something like that and we won't be able to stop, but we put it out for your consideration.

As well, we would like to fly by the Cedar Narrows/Essex Lake area in the Manitou Lake system where various fishing camps are allegedly threatened.

Now, without listing the specific areas, I would refer you to the various group tours in the Ministry of Natural Resources' proposal and we have listed them under those particular groups. And what we are going to indicate is the areas that we want to stop at of those items listed in those groups.

The other ones that are not listed specifically, we presume we would be flying by on the way to the ones that we would be stopping at. If they all cannot be included in a flyby, that is all right too.

With respect to the MNR's Group 7 Tour, we were wondering, firstly, whether this July, '88 prescribed burn near the Sowden lake, when that is being planned to take place?

MS. MURPHY: Mr. Chairman, I think we can advise at this time that it is pretty difficult, given the fire situation, to forecast whether they will actually do that burn at all.

THE CHAIRMAN: Oh, I see. Okay, very good.

Okay. Going back now to the MNR Group 1 list, we would like to see items 1 and 2.

With respect to Group 3, we would like to stop at items 1, 2, 3, either 4 or 5, 9, 10, and 17.

With respect to Group 5, we would like to stop at item 1 and item 6, and then presumably we would be flying by 2, 5 and 9. We do not care whether we see any of the other items in that group.

With respect to Group 10, we would like to flyby 1, 2, 3 and 4. I guess all of them in group 10. And the same for Group 11, the two items there we would like to flyby.

Group 12, we are interested in item No. 4. Group 13, we are interested in item No. 1, and Group 16, we are interested in item No. 1; and Group 17, we are interested in item No. 4.

Now, with respect to weather contingencies. In the event that the weather is not good for flying, then we would like to utilize that time to make some tours of the mills in the Dryden area, and we thought it might be possible and interesting to have a simulated ground cruise. And, again, if it is not good enough for flying, it may not be terrible weather to go into the bush to do a simulated ground cruise somewhere.

That is just a suggestion. Now, you may have some other suggestions as to what we can do if we cannot get into the air to go to some of these other places.

In the event that we do not get to see any of the mills during this site tour, we will have an opportunity when we are in Dryden later on in this hearing. So it does not matter if we do not get to see any of the mills on this particular tour.

Now, we feel that in choosing these particular items we certainly have taken into account the submissions made by all of the parties and we feel it will give us a fairly good representation of some activities and some locations that are in this northwest area of the province.

Once again, for those parties who are concerned because we have not chosen a specific item that they wanted us to see, please realize that we will be in the northwest area of the province in at least two or three other locations for the hearing later on and we may well end up having smaller site visits at that time, if we feel that it is going to be helpful to us understanding the evidence coming in.

At the moment I am not sure of the exact participation that is anticipated, but I understand that it may be possible, for the numbers that want to come, to have one of the medium-sized helicopters for the second one as opposed to the large one. And I just want to reiterate what we have indicated to the parties

earlier and, that is, we will not be allowing cameras or video equipment to be taken or utilized by any of the parties nor the Board.

We will be allowing the media - and there is an indication from the media that they want to accompany us, one representative - they will be allowed to take either photographs or video shots because whatever use they make of their photographs will not be evidence at this hearing and we will certainly not be relying on whatever they do for our deliberations in connection with a decision.

We do not want to get involved into evidentiary problems by any of the parties taking any pictures on this site visit.

Okay. Is there anything that any one wishes to comment on in connection with this proposed site visit?

One last thing: We notice in the original proposal by the Ministry with respect to dress that it was recommended that everybody have work boots, steel-toed work boots. That is a requirement, I understand.

MS. MURPHY: Yes. If you are planning to get out and walk around it is.

THE CHAIRMAN: And that would be the

responsibility of everybody?

MS. MURPHY: Yes. Mrs. Koven can borrow mine, if you like. I got some for doing the same thing last year.

THE CHAIRMAN: All right. You are going to be providing hard hats and, I take it, at some point you will give us a list of what else we may need, if anything.

MS. MURPHY: I don't think there will be anything else.

THE CHAIRMAN: Do you need mosquito netting and all that kind of stuff, and insecticide...

MS. MURPHY: Maybe we better provide a list, if we think of anything else that you need.

THE CHAIRMAN: Okay. We also notice there was not a site planned for a fishing trip. Mr. Martel is somewhat upset that fishing was not included, however, we will rectify that, believe me, before the end of the hearing, I hope.

Okay. What we would like you to do is come back with an itinerary and any other problems that you see with what we have proposed and, once the final itinerary is worked out, it is our intention to distribute it amongst the parties so that the parties who are not coming know what we are intending to see,

and we will leave it at that.

MS. MURPHY: I think, as Mr. Kennedy mentions, we will need to know the actual number of people by at least some date, perhaps this week--

THE CHAIRMAN: Do you know?

MR. MANDER: I think it is going to be...

MS. MURPHY: --in order to determine what size of machines or whether we need two or...

MR. MANDER: Nine I think.

THE CHAIRMAN: Total?

MR. MANNING: Yes, make it eight or nine, it depends on the media. I will check.

THE CHAIRMAN: All right, Mr. Mander will let you know later today.

We had indicated to everyone that they should be advising us at the end of last week as to whether or not they are coming, I think most of the parties have. He should be able to give you a final figure by the end of today.

The only one that is uncertain, I think, at the moment is the representative of the media. And, of course, to some extent that depends on what else is going on that particular week as to whether they will be there.

MS. MURPHY: I will just speak to Mr.

Mander about it before the end of the day.

THE CHAIRMAN: Okay.

Very well. If there is nothing other of a preliminary nature, we can proceed with the evidence.

JOHN EDWARD OSBORN,
KENNETH A. ARMSON, Resumed

CONTINUED DIRECT EXAMINATION BY MR. FREIDIN:

Q. When we adjourned, Dr. Osborn, you had gone through the first group of FRI Futures up to and including paragraph 76.

And before we deal with the second grouping of FRI Futures, one of the things you indicated that you would do in relation to the formula which identified the number of plots one would have to use depending on the error that one was willing to accept, that you were going to come back to that formula and explain what T was in that formula.

I believe that Exhibit 97 was the exhibit which had that formula on it. Is that the exhibit there, Dr. Osborn?

DR. OSBORN: A. No.

Q. Perhaps you could just redo the formula.

A. The formula was the number of samples, which is a function of the co-efficient of

variation squared, divided by the error per cent squared, and I made earlier allusion to T was a constant and I put in the equation when we were doing some arithmetic the value was 2 square or 4.

Now, in fact what I did, therefore, on Thursday last was simplify the situation as the first step because I wanted to demonstrate the relationship between the variability of the population and the acceptable managerial error, and I wanted to demonstrate that the relationship between those two, what happened, and keep T out of it for the moment.

And so that was really what was explained on Thursday. And I made a comment on Thursday that I would come back and explain what T was and that is what I wanted to do right now because T does have a bearing upon the answer. And to provide you with a complete story, you need to have some understanding of what T is all about. And I will try and keep this simple because this is relatively complicated.

What I have drawn on this exhibit --

Q. Perhaps we could number that.

THE CHAIRMAN: That will be Exhibit No. 103, I believe.

---EXHIBIT NO. 103: Hand-drawn diagram Entitled: Distribution of 'T'.

DR. OSBORN: And the heading of Exhibit 103 is the Distribution of T. And the value of T that I used in the equation was the value number 2, and I will explain where on that chart we find 2 and under what circumstances.

Now, the value of T will vary with different probabilities and the value of T will also vary with what are called different degrees of freedom. Let me take the second one first, the degrees of freedom.

In the sample we were taking the degrees of freedom, this kind of sample, is the number of samples minus one. So when we ended up with 256 last week, the degrees of freedom would have been 255.

Now, the degrees of freedom - Mr. Armson just gave you a very simple explanation of how to think of it - if you have three objects A, B and C and you are trying to compare them, you can compare A to C and you can compare A to B and if you know those two comparisons you can deduce what the values are to compare B to C. So out of the three objects you only need two comparisons to end up describing the situation.

For three objects, there is two comparisons, the number of objects less one. So that

concept is applied all the way up. When you have 255 entities out there, you only need 254 comparisons.

The degrees of freedom is the number of samples minus one and the value of T will change as the degrees of freedom increases.

And as the chart will show, for example in the second column, the value of T starts at a value of 1 and gets progressively smaller and smaller, but as soon as it has gone past 30, which is a value of .68, it is almost constant from 30 through 60 samples, through infinity.

So T starts off with a value that in fact decreases very quickly and eventually stabilizes very close to the 30 line where there is a horizontal bar I have drawn on Exhibit 103.

In statistics, a number of samples less than 30 gives statisticians some unease because some things happen to their rules. Above 30, the situation is relatively well understood.

So I gave you a number which was 2, which in fact is the number that is below that line of 30 in the more stable part of the degrees of freedom. And, in fact, we had an arithematic of 256 samples, which is down in the 60 to infinity range.

So in terms of degrees of freedom, T will

start off at a high number, drop very quickly and almost become stable from 30 samples onwards.

Now, the second way in which T varies. T also will vary and T will go from a small number to a large number as we demand to be more certain about our estimate. And on the chart, I have picked some values that go from a probability of .5, which means if we go out into the forest 100 times to take a sample or set of samples -- I am sorry, go out 100 times to take sets of samples, 50 per cent of those sets will provide us with an estimate inside the range we expect, but the other 50 per cent will be outside that calculated range.

So we go from being right 50 times out of 100 to 70 times out of a hundred, more demanding; 95 times out of a hundred, more demanding; 99 times out of a hundred, more demanding. So as we go across the chart to the right, the probability of success gets higher and higher, we are more and more demanding in that we want to be right, we want to be right.

Until eventually the furthest right-hand column is 99 times out of a thousand we want to be right and as we go across in that direction being more demanding, the value of T will increase.

Let's come to the 30 sample level. If we

only need to be right 50 per cent of the time, we are pretty -- as managers, pretty acceptable in terms of how right or wrong we want the answer, the value of T is .68.

When we want to be right 70 times out of every hundred, the value of T is 1 approximately. When we want to be right 95 times out of a hundred, a probability of .95, very frequently the probability used in gallop polls in newspapers - and even quoted now in newspapers - they talk about a value at the 95 per cent probability level, this is what they are talking about, they are talking about a value that is 95 times out of a hundred the estimate is within a defined range for which the value of T was 2.

If you want to be right 99 times out of a hundred, the value of T increases to 2.75; and if you want to be right 999 times out of a thousand, T is even larger. So T varies with the size of the sample becoming also a constant from 30 onwards and T varies as you become more demanding as a manager.

And I cited values of 2 - 95 per cent probability level, a very typical resource management level of probability that's used, and the value of 2 is that which the value of T that is starting to stabilize.

So on the diagram, the careful mark above the 30 is to be aware that as the sample size -- if the sample size were to become less than 30, you have to be very careful how you apply the statistics; some of the rules start to change.

Why tell you this? Because the value of N that we calculated if we make T bigger -- if we make T bigger, which would get if we were more demanding in the probability level we are chasing, then the number of samples would increase.

So I say T was a constant. I gave you the answer as 2 because in the 95 per cent probability level and for a large number of samples it virtually is 2. But the point I wanted to make is that if you were more demanding or less demanding, this value that I called a constant does in fact change.

It was just to complete the whole story as opposed to lead you partway through the equation, wa why I wanted to explain the values in Exhibit 103.

Q. And when you were giving the evidence and referring to something being plus or minus 5 per cent, did that have any relationship to Exhibit 103?

A. Yes, but it is not the plus or minus five -- it's not the 5 per cent probability I am talking about in the explanation of T. The plus or

minus 5 per cent is what we are talking about in this value.

Q. Okay.

A. Not in the T -- in the value that's called E per cent squared, not the T value.

Q. Thank you. Now, if you could go back to the witness statement, Dr. Osborn, dealing with FRI Futures.

When you gave your evidence in relation to I believe the remote imagery, you referred the Board to certain recommendations of the Rosehart Report.

You didn't make any reference in relation to the Rosehart Report regarding paragraphs 73 through 76 inclusive, and I am just wondering whether you could go back to those paragraphs and indicate whether the subject matter described there in fact was the subject matter in whole or in part of the recommendation by Dr. Rosehart?

A. In the evidence on page 36, paragraph 34 briefly described some of the work and some of the suggestions about infrared photography and within --

Q. You mean paragraph 74?

A. Paragraph 74. And in Exhibit 93, which is the Rosehart Report. On page 19 of the Exhibit 93 where there is a list of recommendations,

the Rosehart Report contains Recommendation No. 16 on the bottom of page 19 and Recommend 16 of the Rosehart Report reads that:

> "The forest resources inventory continue to monitor and research new film and camera technologies with the long-term objective of incorporating such technology as inventory intensity requires."

So there is a recommendation that in essence we continue with and develop further this testing of film and cameras to enhance the data capture part of the forest resource inventory.

In the evidence of this panel on page 36, in paragraph 75, I made reference to the suggested use of large-scale photography and, again, within Exhibit 93 the Rosehart Report, there are in fact two recommendations that are related to this suggestion of using large-scale photography.

And again on page 19 of Exhibit 93, Recommendation 13 reads that:

> "The Ministry of Natural Resources conduct an evaluation how best to estimate volume and implement the findings of such a study to produce more

reliable volume estimate techniques."

And on last Thursday there was a discussion specifically with Mr. Martel as regard this particular technology. And, similarly, on that same page on Exhibit 93, Recommendation 15 reads that:

> "The Ministry of Natural Resources proceed with its pilot survey using large-scale photography technology and then proceed as soon as possible to make a decision about its operational suitability."

And the last paragraph, paragraph 76 of that description of the data capture routine, it is on page 36, which was a description of the use of mini-prints, those little prints that were to do the quality control.

The reference to the Rosehart Report or Exhibit 93, in essence, is Recommendation 10 and that's the Ministry being recommended to explore with the private sector inventory companies ways in which they can bring their expertise to the forest inventory resources.

And, in essence, what came out of the mini-print was a very much customized machine with private industry that will lend itself to quality

control.

Q. All right. Could you then, Dr. Osborn, continue and deal with the second part of the FRI Futures which begins at paragraph 77.

A. Paragraph 77 to 84 really are a list of suggestions of items partly under way and/or planned that can improve the ways in which the data are both processed and made available to managers for analysis. And, as paragraph 77 states, all of this revolves around the use of computer technology.

Now, the first of those items is given in paragraph 78 and that briefly describes a set of computer software routines that were developed through 1980, '81, '82, to produce a system - hardware, software and trained people - to improve the speed with which main office could process the compilation part of the FRI, the compilation part being: We take the numbers from the work sheets, from the photographs, we process them through a computer to produce a set of standardized reports.

Now, prior to 1980 much of that process was done by other government agencies for us and the operational efficiency of that left a lot to be desired. So we took the whole operation in-house, essentially rewrote the routines to make this function

a lot more efficiently.

And there was a second spinoff benefit that came out of that development. This was the first time the data could be made available to the field manager in a micro-computer environment that didn't have to have a large expensive machine in the field, we could now have a machine that you could afford in your local office, and that machine could take those data, those FRI data, stand, by stand, by stand and the same set of software that would enable you, had you got the changed data, to both verify and/or modify the FRI data stand, by stand, by stand as you found it was warranted.

So if you went out and you did some form of check, some form of cruise, some form of assessment, those results you could incorporate straight away to produce a more up-to-date set of data locally.

Q. I think the slide that Dr. Osborn is going to put up wasn't in the material, but it was spoken to in the material.

Perhaps I will distribute a copy of the slide.

THE CHAIRMAN: It will be Exhibit 104, entitled: FRI Updating.

---EXHIBIT NO. 104: FRI Updating.

DR. OSBORN: At this point in time the field forester has two possible tools to update the FRI. The one I am describing at the moment is the second one, the one on the left-hand side under the heading of tool, has the short form, acronym of F-R-I-D-E-S, forest Resource Inventory Data Entry System, FRIDES.

And as the title infers on the diagram, it is essentially a computer bookkeeping set of software.

But on the right-hand column of the diagram under data and its source, for FRIDES we are talking of stand level details which may come from any number of surveys, and the list given is an indication of the kind of source those data could come from: operational cruising; depletion records, that's record of cut or burned, for example; something called NSR surveys - that's surveys of areas that are NSR or not satisfactorily regenerated - and more will be said about NSR surveys in Panel 4 - and the fourth item was FTG or free to grow assessments.

So a variety of which these are examples of data collection procedures at the local level exist, some of which have been described earlier in this panel

and some which will be given in more detail in Panel 4.

Those surveys collect data and the field forester has the opportunity to bring his or her FRI up to date using the FRI data entry system of software.

MRS. KOVEN: Excuse me, Dr. Osborn. What are depletion records?

DR. OSBORN: Examples would be records of cut -- the area cut, for example, another form of depletion would be the area burnt, so things that have taken away from the forest, depleted the forest, be they cut, be they burn, be they insect defoliation, mortality or be they land use changes, we lose in a forest management sense some acres because the land use change gets taken into a provincial park. From a timber management point of view, that's a depletion from the base. So they were the four main causes of depletion in the history.

So paragraph 78 really alluded to this software system which enabled both the increased and improved throughput in main office but also, secondly, the field foresters to have their data in a form they can do something with and a set of software to help them keep it up to date.

MR. FREIDIN: Q. Is that particular subject matter referred to in the Rosehart Report?

A. Yes. And on page -- on Exhibit 93, page 19, Recommendation 14 speaks to the -- really the difficulty with the 20-year cycle of the FRI.

Recommendation 14 states that:

"The cycle time of the inventory not change from the current 20-year cycle, but if the forest resources inventory system improves and regulates its data updating procedures as outlined in this report, cycle time will become irrelevant and inventory data would be revised continuously."

And this piece of software called FRIDES is an aid to that end.

Q. I would just like you to continue through these, Dr. Osborn, and speak to each one as you go.

A. On page 38, on paragraph 79, the statement is headed: A Standardization of Forest Resources Inventory Terminology, and this was a plea to try and ensure that what the FRI called jack pine was what the silviculturalists called jack pine, which was what the land use planner called jack pine as a simplistic example.

The introduction of computers

particularly has demanded standardization so data can be aggregated and cross-referenced. It is very frustrating to try and do analysis if your idea of jack pine isn't exactly another person's, it leads to all sorts of ambiguities.

So the idea of standardization is almost axiomatic with computer systems. To that extent, computers have been very useful in forcing people to think in logical lines.

MRS. KOVEN: What else would you call a jack pine?

DR. OSBORN: You may, when you describe jack pine, also include the Scots pine. Now, why?

In southern Ontario there are areas of Scots pine and jack pine, both in mixtures and in separate plantations. There may not be enough of them that the manager will decide: Ah, these pines all look the same, they are managed the same, I will lump them altogether.

So perhaps in southern Ontario I will lump together those two different species and I will call them all jack pine. Now, that is fine, it may be very appropriate for a local manager but if I, in charge of the provincial data set, add all the numbers together and I am adding jack pine from the northwest,

the northeast and the south, the bundle from the south, called jack pine, is not quite what I expect it to be, it is now a mixture of something.

So I have got numbers added together that are not quite the truth of how much jack pine is there in the province.

MRS. KOVEN: But when you are using your working group category, it doesn't matter unless the Scots pine were a working group?

DR. OSBORN: Ah, and that is exactly the case. It could be that Scots pine was the working group and there are certain plantations of Scots pine in southern Ontario, and there may be so little of them that even though they are working group Scots pine, for the sake of adding things together the local manager says: Hey, that is really no different and really, although it is Scots pine, I am going to put it into the relatively few working groups I've got, I am going to put it into the jack pine working group.

So there is a local misnomer in a way that comes back to haunt us when we do analysis. If somebody from the northwest wants to look at: How is the jack pine being managed in the south, they are going to get a rather mixed reaction when they don't realize that.

My example perhaps wasn't very good, but it still gets stretched to answer your question.

Okay.

MR. FREIDIN: Q. And was that particular subject matter referred to in whole or in part in any of the recommendations made by Dr. Rosehart?

DR. OSBORN: A. In a way. There is a part of it inherently in Recommendation No. 8, and without reading it, it really speaks to the idea of both the Ministry and industry forming a technical standing group to come up with standardized variables.

Let's make sure we all describe things in the same way, be it species or be it whatever. And so the idea of that standing committee was a recommendation to facilitate that.

If we go to paragraph 80, paragraph 80 is headed GIS Digital Mapping. GIS is geographic information systems and it is becoming -- it's almost becoming sort of an "in Vogue" phrase and the inference is it's new and it's useful in terms of analysis.

Now, just to step back for a moment. Geographic information systems philosophy and technology really exists and has done for many years. In fact, just to step sideways for a moment, if we as managers look at Exhibit 85, a forest stand map in the

Red Lake management unit, and we look at this map and we decide: Where should we go to regenerate certain areas.

So the question is: Where do we go to regenerate? And if you look at this map, you can see on the map where are the areas labeled barren and scattered, and we have described that in the FRI. And that could be the first approximation looking where and adding up the stands that were barren and scattered to answer the question.

Now, that, what we just done, is geographic information systems, the use of some device to indicate where something is in relation to its neighbour or something else to help managers, and we have been doing that sort of technology for 200 years plus.

So GIS isn't some brand new, hot-off-the-shelf concept. The technology that has now come with the computerized way of GIS is new, particularly the ability to put now not just the stand descriptions in the computer to analyze, but to put the map in the computer.

So we can take that Exhibit 85 and we can put all of that map: The boundaries and the relationships between stands and the disance from the

stand to the road and the distance of the stand to the lake, all of that information that you perceive when you look at that map is now possible to put inside a computer and, therefore, is accessible for some form of analysis.

Digitial mapping let's you produce the forest stand map that was given as Exhibit 102. This map was entirely drafted, printed by in fact a digital-driven plotter. The data that are in the computer, the computer has software that says: Put the pen down and drawn a line, lift the pen up and move to the next line, draw the boundary of this particular stand. All of that information is contained within the computer and the plotter enables that to, in fact, come out to resemble a forest stand map.

Okay, that is fine, but that is not really what it's all about. Digital mapping isn't where GIS really should be, it's the ability to have those data, that map sheet and the stand descriptions in the machine that you can start to analyze interactively with the machine: What would happen if I had a 100-metre reserve around this lake? How much wood volume is available with the average digging distance of 600 feet from the existing roads?

Those managerial questions can be

analyzed somewhat easier if the map is in the machine, it's the analysis that is key.

So within paragraph 80 there was a brief comment as to this Ministry has been involved since 79/80 in GIS technology and we went through the use of the technology within a part of southern Ontario. In 1985, there was some reasons whereby we changed the system we were using and we now have a system that is compatible with the Ontario base map program that was spoken to earlier.

That particular system is the same as that which is here at Lakehead University. That particular system is the same as which is now the de facto standard in every provincial agency with the exception of British Columbia in this country. That system is the same as the system that is in the Federal Government in Forestry Petawawa.

At this point in time we have that technology starting in-house in Ontario to develop this, to make it more available for analysis for forest managers.

Now, in light of that and in sort of reference to the Rosehart Report: So in Exhibit 93, on page 19, there are in fact three recommendations that speak to or are related to this idea of GIS and they

are Recommendations 7, 14 and 17.

In paragraph 81 reference was made to the idea of trying to put some of the work involved in GIS technology, some of the work, particularly the data loading part of the work, particularly taking the maps and putting them into the computer - which is a lot easier said than done, that process is quite labour-intensive - and the suggestion made in 80/81 is to try and put part of that out to the private sector.

Now, this in fact we have done over the last three years and we have got a learning curve situation. Private industry is not perhaps completely au fait with this type of technology, not particularly versed exactly what our products are, and so we have had some production times which aren't as good as perhaps we would have liked. There's a learning curve for industry.

It has helped us understand some of the problems. What has come out of it particularly in the last 12 months was the possibility of scanning the map sheet.

Now, if I can, just for a moment, describe how the map is normally put into the computer as opposed to how that may change, because this is a piece of technology that has some real dollar

implications and some real time implications which will improve the usefulness of GIS.

If I look at Exhibit 85, our forest stand map as an example, to put this product, 85, into the computer I literally have to lay down onto a table that has the equivalent of a grid underneath it and, with a pen connected to the computer, I literally track all the lines on the map.

So I literally trace the entire series of lines on the map and each line I tell the computer what the line is. The process is call digitizing and, as one could imagine, the tracing of all those lines rather slowly and rather carefully to get the data into the computer is mind destroying, soul destroying too, but...

It would take typically a person, for that size map sheet, six working days to put the map in the machine. That is the approximate rate of productivity at the moment.

Just as a quick aside, there are 5,500 map sheets approximately in the FRI in Ontario, which doesn't take long to sit and work out how long it's going to take to put the data in. A long time, unless we really up the number of bodies.

Another alternative is to run a product

like Exhibit 85 -- like Exhibit 85, through a machine that is virtually the same as a photocopier. It's called a scanner, but the technology is similar to a photocopier. It's rather a smart photocopier.

We have to do a little bit of doctoring with Exhibit 85 to make this work efficiently, but all of sudden I am into a throughput: Instead of six days per map sheet, to run it through the scanner takes maybe 45 seconds, to unravel the smarts might take me another hour, hour and a half, two hours and I have suddenly got six days down to maybe two hours to put the map through.

And there is quite -- there is a bit more to it than that, but in the order of that magnitude the technology of scanning, which is really changing very quickly - which we are having private contracts about - has increased the throughput.

So, again, we have got recommendations in the Rosehart Report about the use of private industry and we have got recommendations about the use of GIS.

On page 39, paragraph 82 speaks to a computer technical innovation which really says: Put the data in the machine in such a way that I can easily get it out. That is what it says in English. And, in computer jargon, that means put it into some form of

database. Now, the particular piece of GIS technology that Ontario has includes a database management system to aid that process.

That means when somebody asks, for example, as field foresters do: Give me a list of all the stands in my unit which are susceptible to spruce budworm damage, given that I want it out of the spruce and the balsam working groups and I only want it for those stands over age 40 and I only want it for those stands where the balsam fir component is 30 per cent of the stand or more.

A very typical forest management question of: To give me a list of all the stands that may be susceptible next year to spruce budworm. There is a potential of: Where may I have to pay attention and/or look at potential damage.

The FRI can be organized in a variety of ways, but if you put it in a database that sort of question can be answered relatively efficiently than having the 1.5-million records of the entire province which there are - 1.5 million stands in the province - and searching through the 1.5-million to find answers to that set of questions. The organization of those data can be done in efficient fashion that such a question can be answered more easily than otherwise.

And paragraph 83 takes that one step further and says: Fine, that is in main office and that means the field forester has got to come to you to get the answer. How about making those data available to me on a database that I can do that sort of thing, and that is emerging. The particular database main office has got, without getting technical, doesn't fit easily onto the micro the field user has got, so we need to think about and test what sort of database for the field forester is most appropriate.

And we have to think of those questions in relation to not just the FRI, which comes back to the earlier compatibility. We have to make sure that that database not only serves the FRI, but also any other records that need to be related to the FRI. The whole range, perhaps details of what has happened silviculturally. And that leads essentially to what is in paragraph 84.

You cannot do this for the FRI in isloation, you have to recognize the field forester needs to access more than just the FRI, let's make sure what gets developed for the FRI is done in conjunction with other computerized systems.

So it almost comes back to: Why do we want to standardize? Let's make sure all these systems

have jack pine coded the same way.

So there is a list through '82, '83, '84 that tries to tie not only FRI data in an efficient fashion, but also to link it with other sets of data that the forest manager needs to access.

Q. And are any of those three referred to specifically or otherwise in the Rosehart Report?

A. Again, there is parts of Recommendation 14 and 17 that speak to the ability to tie these things together for field foresters.

Q. Recommendation 20 of the Rosehart Report indicates that the Ministry support the forest resources inventory research-related programs, and then refers to two specific matters.

Can you advise, has there been any change in staff or openings for staff for the forest resources inventory research -- pardon me, for the forest resources inventory which is related to research?

A. Yes. About three years ago we made a very concerted effort within the Forest Management Information Section, which handles the FRI, to set aside some of their expertise from the day-to-day events of trying to kick out 33-, 34,000 square kilometres of inventory, let's take that person out of that firing line, operationally, let's put him on one

side to give a chance of looking at: Where should we go tomorrow in terms of technology.

So a position was in fact introduced about three years ago as an FRI research position and we have had somebody in that role.

About two years ago, the government came out with a recruitment training scheme for particularly young people and the Forest Management Information Section was fortunate enough to land one of the eight positions that were given to the Ministry as an FRI trainee. That person's role has been primarily two or three R&D projects, some of them along the lines of that which we just described.

Three years ago, we continued with, but we changed the job into a database manager for GIS technology, this was specialized expertise. We essentially hired or stole somebody from a private company in New Brunswick who had been running that same sort of situation for the last three years and we hired that lady into MNR to implement that sort of structure using GIS technology within MNR.

So there has been two or three different positions where we have tried to put people into looking at tomorrow, as well as -- or perhaps in not having to look at today today's operational features.

Q. Dr. Osborn, assuming you can identify only one of the FRI Futures that you describe in the witness statement in that particular list of FRI Futures, is there any one particular item that you professionally feel that its development and implementation would add to the credibility and usefulness of the forest resource inventory?

A. Yes. In that list of FRI Futures, the one area that I feel both could be and should be improved are the estimates of volume within the FRI, and I personally think, and at the moment I am working towards, one of the methodologies that I think will severely -- that will considerably improve that and that's the use of large-scale photography.

I think that technology offers a chance both to provide some estimates that have some degree of statistical precision and also a possibility of improving the precision and accuracy of the volumetric estimate.

Q. And let's assume that you could identify only one of the recommendations in the Rosehart Report that you have described -- pardon me, which are in there.

Which, if any, recommendation out of the Rosehart Report do you feel professionally should be

developed and implemented in order to add to the credibility and usefulness of the forest resources inventory?

A. There is a recommendation in there, which is Recommendation No. 12, which advocates the use of what are called permanent sample plots. Now, this particular recommendation, this particular idea is to provide some measure of growth data to the forest resources inventory.

As was explained in the beginning, the FRI in Ontario at the moment is primarily a static snapshot estimate of a given point in time. It provides little in the way of information about what or how those data may change through time. There are estimates through the yield tables, it's true, but the FRI primarily is designed to provide a static estimate.

As the wood supply and demands within Ontario change, and they have done so, that sort of design needs to be modified to incorporate some improved measures of dynamic changes through time. And the only forest mensurational way of seriously getting answers to that is through repeated measurements of a set of sample plots and those sample plots measured in that fashion are called permanent sample plots.

Q. Dr. Osborn, I just want to go back to

your evidence of a day or two ago and get some clarification of one of your answers.

You were dealing with the topic of whether or not the forest resources inventory would have to be supplemented, and you listed a number of examples as to the sort of mensurational data that wouldn't be in the FRI that you might want to look for, and one of the things you said was tree count.

Do you recall referring to tree count being one of the things that you might want to learn about?

A. Yes.

Q. Could you tell me what you meant by tree count?

A. Almost as the words imply, the counting of the trees, but what was unsaid was the counting of the trees with reference to their diameter.

Now, this is a very common forestry practice in parts of Ontario and that's the ability to both count and record the number of trees by diameter class. Now, if you put those data in a table in forest mensurational terms it is called a stand table. A stand table lists a number of trees in each and every diameter class in the area that you have sampled.

And, in fact, if you take the next step -

whilst we were talking about that - if you know the average volume of each tree in each diameter class you can estimate the volume in each and every diameter class, and a table of volumes by diameter class is called a stock table, obviously related to our growing stock term right in the beginning.

So when I said tree count I was particularly interested, especially in some areas in knowing how many trees in each and every diameter class. That is not provided in the FRI and, as was asked: What would I go look for if I wanted to supplement the FRI with some mensurational terms which included data to create a stand and stock table given I needed them.

Q. And you say given that you needed them.

A. Yes, because under some circumstances I will definitely need them; in other circumstances they are less important.

For example, we had an example earlier of where I may have been only interested in running a saw mill in those trees which were above a certain size. I wasn't interested in total area, but I was only interested in trees that were 25 or 30 centimetres or larger.

My stand and stock table data would provide quite quickly the estimate of how many trees and/or the volume to that 30 centimetre limit. And then if I changed my mind and I found my mill, in fact, could operate with smaller trees, looking at the table would give me a quick estimate of what might be there in addition to my 30-centimetre trees by looking at what was in the diameter classes down to 5 -- down to 25 centimetres.

So my stand and stock table may be quite useful where I am dealing with a product where diameter class is quite key, and I make reference particularly therefore to the Algonquin region where tree size, as well as other aspects of tree quality, is a rather key facet of management.

Q. Dr. Osborn, should every management unit have the same degree of accuracy of its forest resources inventory?

A. I don't believe so.

Q. Why not?

A. I think each and every unit needs to be assessed as to its importance as measured by the magnitude, location and complexity of the forest, by the type of products that are estimated to come from that forest, by the estimate of how much activity will

take place in that area in the next planning period.

All of those sorts of factors need to be considered, such that if I am in an area that has a valuable resource, that the impression is or the estimates are it's going to be very much in demand in the ensuing planning period, then it pays me to pay more attention to providing a more - I will use the word - accurate estimate of what is there than for a unit where there may be little or no activity for the next five or 10 years and/or the products are a far more generalized or size -- non-size specific nature.

Q. And when you refer to the amount of activity in the next planning period, any particular time frame that you are referring to?

A. If I am looking at the FRI on a 20-year cycle then I am looking at a 20-year period. So I am coming back to the local people and asking: Is there likely to be much activity in this unit, and if there is little, the next question will be: Where do you think that will take place, because then even within the unit I may vary as to how much effort I put into the inventory for the place where the action is going to be in the next five, 10 years than where it is likely to be 50 years down the road.

Q. Does Dr. Rosehart comment on this

particular topic in his report?

A. Yes, there is. Within Exhibit 93, on page 14 -- on page 14 in the left-hand of the two columns, and at the bottom on page 14 at the left-hand column there is a heading entitled: Inventory Intensity, and that paragraph describes essentially that which I have just spoken to.

Q. Perhaps you could just read the paragraph that you are referring to?

A. It reads:

"The accuracy of the FRI should relate to the specific information needed in making forest management decisions. For most management decisions, FRI information will have to be supplemented by additional surveys. However, by defining management objectives and relating these objectives to the relative complexity of the forest it may be possible in certain areas to reach the objectives by using less intensive surveys. For example, in northwestern Ontario, the forests are more uniform in nature than the mixed hardwood stands of the central and southern regions. Thus, in northern

forests simple reconnaissance surveys may actually provide sufficient supplementary data to obtain the objectives. But the same objectives for some forests may require more comprehensive surveys such as operational cruising. The relationship between forest management objectives and forest complexity should govern the intensity of an inventory. The committee feels that inventory designers should consider intensity in terms of the variables to be measured, sampling intensity and scale factors related to the socio-economic value of the inventory. The committee thus recommends..." and then the words of Recommendation 11.

Q. Dr. Osborn, those are the only questions I wanted to ask you in relation to the forest resources inventory, so perhaps we could move on to the discussion of yield regulation which begins at page 39 of the witness statement commencing at paragraph 85.

Dr. Osborn, are there any controls or regulation of the amount of wood that can be harvested on a management unit?

A. Yes.

Q. And could you advise me, what form does that regulation take?

A. For the management unit in question, for the planning period, an estimate is made of the maximum allowable depletion that may be taken from that management unit and still fulfill the objectives of management.

Q. And this process of limiting what you take within any period of time, what is that called?

A. The amount that you are -- the maximum allowable depletion is the words or the expression used to describe the upper limit in yield regulation in Ontario.

Q. Why do you limit the amount?

A. If you come back to the objectives of management, which were twofold, simplistically keeping the wood going in the mill door today and keeping the wood going in the mill door tomorrow in a timber management sense.

So to fulfill the second part of that objective statement, as was described in sustained yield, you have to be cognizant of what the impacts are of the forest structure through time and still fulfill the first one. So what you do today potentially has

impacts on the structure of the forest tomorrow.

Q. And is that subject matter addressed in Document No. 36 which appears at page 239 of the witness statement?

A. Yes. Document 36 entitled: Growing Stock Accruals and Depletions, is a diagram of a form that was very similar to those portrayed last Monday. And so we have on the vertical axis our variable of concern and one difference from the diagrams given back last Monday is that as well as volume - as will be explained later - the measure on the vertical axis may be area. So the variable of interest may be volume or area. And most of this diagram it speaks to volume. So the growing stock line is volume.

On the horizontal axis, we have again a time horizon as we had before, we have a point from today, we have some estimated period through the planning period, some concern beyond. And we, again, have a value of a line that's labeled accruals.

Now, in the previous diagrams given on Monday we talked about growth and accruals on a volume basis, we are talking of growth. If we were talking of accruals on an area basis, we would be talking particularly about areas coming back as free to grow into the base. So the word accruals volumetrically

means growth.

On an area basis, if we talk area, we are talking of the areas we brought back into the base because the areas have proven free to grow.

Q. Just for clarification, if an area is not free to grow, what is the significance of that?

A. It remains as inventory, it sits in the inventory database, but if an area is not free to grow, the area is not included in the base, the area base, that's used for the maximum allowable depletion calculation.

So although the data are not lost, the area is still described, it is still in the database of the FRI. Areas that are not free to grow are not in the base that's used for the calculation of yield.

Q. So hypothetically if - and this is only hypothetically - if the entire management unit was barren and scattered, your maximum allowable depletion would be zero?

A. It would be zero. Now, another difference on this diagram from that which was given on Monday, in the top right-hand corner we had the words, I think, for a specific unit or for a specific piece of geography. Here we have very deliberately said for a forest unit, and we will come back to this particular

label a little later. The easiest way to think of it at the moment is think of it as a working group, we will expand on that in a moment.

We have been through working groups. So we are dealing with the jack pine or the spruce working group and think of it as that for a moment and I will expand upon that a little later. So this particular picture is drawn not only for unit, in fact within the unit it is drawn for each and every working group for the want of explanation at the moment.

Q. And although you will speak about it later, the maximum allowable depletion, is it calculated then for each working group?

A. Yes, it is. You have one of these calculations done for each and every forest unit working group. So in a management unit there are typically four, five, six, however many working groups there are, calculations of the MAD.

Q. How does one determine or calculate the amount or the limit of what can be depleted for each forest unit?

A. It is done through a process called yield regulation and in yield regulation in forest mensuration management there are really three major ways in which it can be calculated.

Q. And they are...?

A. And the three traditional ways is you can use area as the basis for regulation, or you could use volume, primarily growing stock, as the basis for yield regulation, or you can use increment of growth as the basis for the regulation.

Q. Could you advise me what information is required to in fact use these three procedures?

A. The amount of information required -- the type of information required will depend which of the three you choose. With each of them, obviously: If it is area you need area; if it is volume you need volume; if it is increment you need increment, but it is more than that.

For example, if you are using area, as you will see later, you will typically use age-class information as well as just the area statistics. If you are using volume, depending which method of volume regulation you use, all you may need is the growing stock and the rotation in a very simple sense.

So it really does depend which of the three you choose and you also inter-relate to the objectives of management: What is it you are trying to regulate and for what end, as to which one you choose and what data set you need.

Q. Is the information available in Ontario for each of those particular methods?

A. Yes, for each of the three there are, within Ontario, data that we described, each of the three -- the data required for each of the three major ways of doing business, each of the three major ways of yield regulation.

Q. I understand that the document at page 240, Document No. 37, explains the information which is required or could be required and where that information is available; is that correct?

A. Correct. So Document 37, which is both the desired and available information, essentially has the two columns, desired and available, and if we come under the desired, and we are back into some ingredients of sustained yield again, we are back into the area data, volume data, growth data, age-classes and rotation.

So these are the types of data required when we are doing yield regulation. In the FRI we spoke about area, volume and growth and age-classes.

Rotation, we have mentioned before that rotation is a managerial decision, and to date I haven't really explained what rotation really is and how it is determined. Rotation in Ontario is defined

as the length of time between the cutting of one stand and the cutting of its successor on the same site, that length of time.

And, in fact, in the Timber Management Planning Manual which is....

Q. Which is No. 7.

A. In the Timber Management Planning Manual on page 180, there is a diagram, in fact, there is an artistic representation of rotation.

MR. FREIDIN: Excuse me. Does the Board have a copy of that particular document with them?

THE CHAIRMAN: I do not think we have it with us here.

MR. FREIDIN: I am just wondering were you going to have a ten-minute break.

THE CHAIRMAN: Are you going to be into this document in any major way?

DR. OSBORN: No.

MR. FREIDIN: Not in a major way.

DR. OSBORN: Just to make allusion to the fact that there is a pictorial representation, but rotation isn't in here, so that's okay. That was the only reference to it.

THE CHAIRMAN: Okay.

DR. OSBORN: Rotation --

THE CHAIRMAN: What page was that, Mr. Freidin?

MR. FREIDIN: Page 180. I can just make one copy available to the Board for now. (handed)

THE CHAIRMAN: All right. Thank you.

DR. OSBORN: There are a variety of different rotations that can be selected, different criteria selecting the rotation. And the first one is the rotation which gives rise to the maximum volume production: Which rotation will give me the greatest volume of this area.

MR. FREIDIN: Q. Are you able to determine when you might get the maximum volume off an area by reference to the yield tables?

DR. OSBORN: A. Yes. In the evidence for the panel on page 207, for example - which happened to be the Imperial yield tables - I was going to cite an example from there that I want to use for the second rotation type as well.

So on page 207 -- and this can be done in Imperial or metric, the concept is the same. On page 207, if we come across to the seventh and eighth columns, we come across to two columns, one of which is labeled CAI and the second of which is labeled MAI and what we are looking for is the greatest production

volume comes when the mean annual increment, the average reaches its maximum. The mean annual increment slowly increases, builds up to a maximum, and then as the stands start to collapse and open up it will fall away.

Now, the mean annual increment's culmination, the age at which that culminates is the rotation that will give rise to the maximum volume production. And we are looking at columns that are the main stand gross total volume. So given that for the moment, the mean annual increment column, which starts at 10.8, will increase, increase, increase to a value of 34.7 which is around age 85.

So in black spruce site class 2, the MAI GT -- in gross total volume culminates at age 85. That is the maximum MAI value.

So our stands are getting bigger and bigger and bigger on a per year basis until they reach a value that they will still increase in size but the overall growth rate is dropping off, so the average is falling off.

Now, where that MAI culminates is the rotation for the maximum volume production. It is very simple to work that out. The MAI it often is a flat value, it is often a flat part of the curve. It also

is where the current annual increment equals it, the particular year, the average over the whole time, and the annual growth rate are the same, is the year in which you will get the greatest volume production.

And so you will see that at age 85, if you look at the CAI column, you are between 35.2 and 31.8. So somewhere in and around age 85 is where those two will cross.

And a diagramtic representation of this is also in the Timber Management Planning Manual and many other forest textbooks on this particular issue.

So one of the rotations, one of the managerial choices is: Let's grow my trees for maximum volume production. And we see how we can derive that for black spruce site class 2 and the value will vary species by species, site class by site class.

Now, staying on page 207, at age 85 in the third column, and at age 85 there is a column that reads DBH in inches, and the value in the third column age 85 is 4.5 inches. That is the average value of all the trees in the black spruce site class 2, the average value. If we took the diameter at breast height it is 4.5 inches; some trees bigger, some trees smaller.

What happens if we want to manage for a product that demands bigger average trees, and we could

go through column 3 on page 207, and if we wanted to manage -- to have an average stand diameter of 5.5 inches you would have to have a rotation, according to the yield table, of 120 years.

The determining of the rotation to produce a product of a specific size is called a technical rotation. In a longer maximum volume, almost certainly you will forego total volume in growing them that long, but you will produce trees of the size you require.

So we have had a rotation of maximum volume production and a technical rotation, and they are the two main rotation-setting descriptions that are practiced in Ontario. There are two others I will mention.

The third of this list would be a pathological rotation. How long can I grow the trees before something gets at them, particularly a pest? If your tree is susceptible, particularly when it gets old to a disease, what is the length of time I can grow it to keep it healthy enough to be able to harvest it before the pest gets at it.

And an example in Ontario may well be balsam fir where spruce budworm gets at balsam fir, particularly when it gets old, though not only when it

gets old. So it may pay to manage balsam fir given you can still get a marketable sized tree on a relatively short rotation. Now, there are other species too that can be considered.

The fourth type of rotation is what is called an economic rotation and that, in a way, is a matter of applying the economic parameters to the first one, the maximum volume production one. What is the value of the tree versus the cost of producing it.

Now, there is a whole slew of subsets of economic rotations, but in a logical sense we are into what is the tree worth versus what is the cost of money. And typically the economic rotation is shorter than the maximum volume production rotation, unless you have an incredibly valuable large product. Given the cost of money today, it has got to be very, very valuable before that is going to be longer than maximum volume production.

So they are the four typical rotation values of which the first two, maximum volume and technical, are the ones typically practised in Ontario. And, again, I will stress both the technical and the maximum volume will both vary working group by working group, site class by site class.

THE CHAIRMAN: Mr. Freidin, I think it is

probably an appropriate time for a break.

MR. FREIDIN: Very well.

THE CHAIRMAN: The Board will rise for 20 minutes.

Thank you.

---Recess at 2:40 p.m.

---Upon resuming at 3:05 p.m.

THE CHAIRMAN: Thank you. Be seated, please.

MR. FREIDIN: Q. All right, Dr. Osborn, you were on rotation. Have you completed your description then of the list on the left-hand side of page 240?

DR. OSBORN: A. Yes.

Q. Okay. And could you then indicate where the information in relation to those things can be found?

A. If we come back to Document 37 on page 240, the simple answer as to where can the data for the desired be found is, they are contained within the forest resources inventory. And just to quickly summarize that list, because we have been through these data and explained where they come from, what they are. The area listed in the FRI, the volume, in brackets we have GTV, and we have explained the FRI produces gross

total volume estimates primarily, is typically the volume figure in the FRI.

In terms of growth, within the forest resource inventory we described the yield tables, YT being the abbreviation for the yield table, and within the yield table our estimates of the current annual increment. In fact, we have just looked at those values when we were describing rotation determination, and we have also seen in the FRI that the CAI is listed in the forest record.

In the FRI we have described that the data are organized and presented, tabulated in age-classes. Each and every forest stand has an age estimate. The data are often summarized into age-classes, and we presented that before and the report for that.

Now, the last two values, working group and site class, are in brackets. They are in the forest resources inventory and they really are the answer to what helps determine that rotation. And in the description of rotations we saw that if we went by working group and by site class to get the value for the maximum volume rotation - and it will vary by working group and site class - and we spoke about technical rotation and, because the growth rate is

affected by both the species and the site class, obviously that too would be affected by working group and site class. And even our pathological rotation is relevant to certain species.

Q. Dr. Osborn, do you need all of the information that you just referred to to do yield regulation?

A. You need that part of it necessary for the particular technique you are going to use. So you don't need necessarily all those items that I have just listed from the FRI, but you need those parts of that list relative to the technique: Area, volume increment, that you do use.

Q. Is all the information which is required for any one of those three approaches, is all the information being in the FRI something which has occurred by chance or by design?

A. Very deliberately by design. When the FRI was put together back in the late 1940s, the form and format of how those data were in fact collected and compiled was driven by forest management.

And if we come right the way back to the beginning, in fact at the beginning of the evidence I presented where I had explained that forest mensuration, which the FRI is a piece, is essentially

the numerical subset behind management.

So, again, the forest management style, philosophy, methodology will dictate the design required to collect the numbers that go behind it.

Q. And could you advise, what would cause a forester to choose one approach as opposed to another?

A. Really three items. The first, in a way, is the availability of the data and the reliability of the data.

The second -- and these aren't in any preference because the first one will be what the management objectives and philosophies were, the first one. The second one is the availability of the data. And the third one would be the familiarity of the manager with the tools and techniques of yield regulation.

There are many, many yield regulation procedures and formula, such as textbooks on yield regulation. The method that is selected should be one which is that which is familiar to the people practising it.

MR. MARTEL: Can you tell me what the first one was again, please?

DR. OSBORN: Yes, sir. The availability

of the data.

MR. MARTEL: No. Then what is the second one?

DR. OSBORN: The management objectives and philosophy--

MR. MARTEL: Right, thank you.

DR. OSBORN: --which of those to we use given our management style.

MR. MARTEL: That is the one.

DR. OSBORN: I can exemplify that with something I have mentioned earlier. Within, for example, the United States, much of the inventory is based upon a set of plots to record relatively precisely what do they have and how is it changing, but with little or no connotation of where it all is.

In forest management style, in parts of the States, they wanted to know what they got and what was happening to it without the details of where it was. Their inventory, therefore, was the continuous forest inventory set of plots, management style.

In Ontario, the question of where was something has always been key and, therefore, the idea of mapping, as Exhibit 85, each and every forest stand was a fundamental piece of management style which caused the inventory design to be that way in Ontario

as opposed to that which is practised in some parts of the United States.

MR. FREIDIN: Q. In your answer to Mr. Martel you indicated the first item was availability of data. The first time you went through the list you said availability and reliability of data.

A. Yes.

Q. Is reliability part of -- or should reliability of the data be part of that first...

A. Yes, both terms are relevant: Have you got it, and if you have got it, what do you know about it as to how far you can take it.

Q. Which method of yield regulation is used in Ontario?

A. Of the three: Area, volume and increment, Ontario uses area method for yield regulation.

Q. And could you advise why the area method of yield regulation was chosen?

A. Yes. Document 41 on page 244, and this document which is on page 244 -- this document describes that, within Ontario, variables used in yield regulation are area by forest unit and we have made reference to forest unit before - I'm saying at the moment, think of it as a working group - it is done by

area but with estimates of the volume expected and the process tracks the growth impacts.

So it is the area method, there is estimates of volume to be expected from those areas in the yield regulation and the growth is not ignored but, in essence, the system will let you look at and assess the impacts that yield regulation are having on the growth of the forest.

Q. And can you advise why that was the chosen?

A. As the diagram on page 244 shows, it comes back to the question about reliability of the data. The FRI provides area, volume and growth. However, the reliability of the area and the volume and the growth data within the FRI vary.

The area data by age-class and working group are accurate. We have the area of each and every stand labeled as to its working group and its age-class.

However, the volume estimates for those data, as has been described, are volume estimates from overall provincial tables with some assumptions brought in. Those same data are by age-class and working group, it's true, but they are certainly less accurate than the area statistics.

And the third major component, the growth, which again the FRI has by age-class and working group, is certainly the least accurate of the three. Not only is it based upon provincial tables, it is based upon provincial tables which are yield tables and not growth tables, they are tables describing what would I expect to get at a point in time, yield; they are not tables that show directly what would be the growth rate.

The growth rate values in the yield tables are obtained by deduction, not by measurement. So for those reasons, we were back to the reliability of the data, Ontario uses an area method of yield regulation.

Q. Assuming that you had equally reliable information in relation to each approach to yield regulation, which one would you choose?

A. Given the objectives of management are volume, I would prefer as a professional to use the volumetric method of yield regulation and I would prefer to use that in conjunction with growth because it is the growth of the forest I really wish to manage.

So a combination of volume and growth would be a better set of data, in my estimation, given that they were in existence and were reliable.

Q. Can you advise what would be involved

in getting reliable data re: volume and increment?

A. One way of obtaining it -- well, let's talk about the volume first of all. We have described at some length how we get volume right now, we have described with some little amount of detail how that could be improved: Having better local estimates of what volume tables actually were, is one way of doing this, that's supplementary information on a volume table basis which is partly being practised in Ontario. That is one way, that is still a static measurement.

A second way of obtaining both the volume estimate and the growth estimate would be to use and structure a set of permanent sample plots in Ontario.

Q. Those are the permanent sample plots that you referred to earlier when you chose the one recommendation of Dr. Rosehart?

A. That is correct.

Q. And what would you have to do to get more reliable information in relation to increment?

A. The permanent sample plots are certainly a necessity because you could measure a set of plots, you could measure -- go out into the forest and measure a set of plots at five-year intervals. If you didn't measure exactly the same trees because of

the natural variability in the forest, the differences between time one and time two, the growth differences, would have a very large sampling error - and this is not unique to Ontario - and so statisticians and forest mensurationists have found that the remeasurement of samples, different samples at periods of time is inefficient.

You get such a large area you are not sure what you are measuring is a true difference or whether is an ambiguity of the sample. And so the methodology has been, and has been practised for years, of remeasuring the same trees at periods of time to truly indicate whether in fact their growth is a little or a lot.

Q. Now, in your earlier evidence you identified the metric yield tables for black spruce, jack pine and red pine, that was Exhibit 88. Do you have a copy of that?

A. Yes, I do.

Q. And if you look at the red pine yield tables and you look at the second last page, it is page 12 of that particular exhibit, where red pine is described as having been planted and moderately thinned.

Are you aware whether that yield table

was based on permanent sample plots?

A. Yes, it was.

Q. If you wanted to estimate the growth rate for red pine planted and heavily thinned, would you need an additional set of permanent sample plots?

A. Ideally you would. There really should be a set of sample plots covering the range of spacing, the range of planting distance, and the set of thinning regimes. That would be ideal. So that would be the true answer to the question.

However, within the same species, it may be possible to make some inferences as to what the impacts of heavy thinning might be with the same set of permanent sample plots. So that is a possibility.

However, if you really want the true answer of what happened, particularly if the spacing initially was different and, therefore, the thinning regime was different, you should have another series of permanent sample plots.

Q. Could you advise then what determines how many sets of plots might be required?

A. You are certainly looking for sets by working group, by working group, by working group because each species has some rather unique growth characteristics. So for each and every one of the

major working groups we are looking at a set of plots.

Now, that presupposes they are pure, but let's not worry about all the possible combinations of the species being mixed up, rightly or wrongly.

Within each of the working groups there are some variation again by site class which has some impacts on how trees grow. More importantly, and much more importantly in terms of the forests of tomorrow, is being -- having sets of plots that actually describe and measure the different regimes of thinning.

So you need sets of plots really that speak to different treatments, which is a combination of initial spacing and subsequent treatment. So you are really looking -- within a working group you are looking at sets of plots for different treatments. The treatment is spacing and thinning and, possibly, other silvicultural practices.

For example, suggestions were made some four or five years ago from the University of Toronto, of a study looking at the impact of growth and yield that took into account defoliation from pests. How do those stands grow under different regimes of defoliation.

If you really want the answer you have got to have samples that cover that environment. So

the number of plots, the number of sets of sample plots can become very large very quickly.

Q. All right. For any particular set of sample plots, where you are trying to get information about a specific -- with respect to the effect of some specific silvicultural activity, to get that information, how many times would you have to go out to your permanent sample plots and measure?

A. If you are looking for some growth statistics you are typically looking at at least three measurements and more. Two measurements will give you, first, proxy of growth, but what have you really got other than the number. If you are really looking, is that number part of a trend or is it rather abnormal from whatever the circumstances were, you are looking at at least three sets of measurements and beyond if you are doing a series.

Q. And typically how great a period between each sample?

A. Particularly in the boreal, you are talking of a 10 year between periods. It can be less, but typically ten years.

Q. Is there any way you can approximate how many plots you might need in Ontario to -- I guess it would depend on -- well, I will let you deal with

it.

Can you quantify how many plots might be required in Ontario?

A. No, there isn't some magic calculation unless we work out how many plots there might be. So the answer I am going to provide is a proxy from next door from Quebec.

Now, Quebec have a forest that is not too dissimilar from Ontario in many regards. In Quebec, my equivalent in Quebec Provincial Government has something in the order of 7,000 permanent sample plots.

Just to add to that, permanent sample plot costs in the order of 500- to $3,000 per plot depending upon the objectives of the plot, whether it is a little or a lot out of that range, but even at $1,000 a plot, Quebec have got $7-million invested in permanent sample plots.

A far greater concern in permanent sample plots over the initiation of those is the commitment to maintain them because the records require continuity or else you are absolutely looking at growth data which is what we are looking for. So the commitment to maintain them is absolutely mandatory.

Q. Now, I am going to ask you, Dr. Osborn, to review the area method which in fact is used

in Ontario and indicate how that determination is made.

But, before you do that, I understand that there are three paragraphs in the witness statement that you were not going to be speaking to and those are paragraphs 89, 90 and 91, and the documents which accompany them, Documents 38, 39 and 40.

And perhaps before we skip those and get into the area method, you could explain why you are not going to be speaking to those three paragraphs?

A. The three paragraphs and the three diagrams were primarily an elucidation and explanation as to some of the mechanics of the volumetric method of yield regulation.

There were some linkages between how that is done in relation to some of the sustained yields concept of the beginning part of evidence and it was thought that, given that I am going to explain in more detail and given Ontario practices, the area method of doing yield regulation, to sidetrack you right in the front end of this into volume and then take it away again was not very constructive.

So, in essence, I have jumped over my initial thought and I've gone straight into: Let's tell you what Ontario does without trying to confuse you with some part of the story that is what we don't

do.

THE CHAIRMAN: Dr. Osborn, just to complete this volumetric approach. As I understand what you are saying, Ontario does not practice it now, you feel that if we had the data for those types of calculations that would perhaps be better, but if we were to try and get that data in any kind of accurate form you would be looking at least 30 years ahead which would take you for at least three time periods in order to measure, once having established the plots, which in itself would take some time. So you are probably looking at well in excess of 30 years to get data that would be of any kind of reliability.

Have I got that right?

DR. OSBORN: Yes, with one caveat and that's, if you are going for volume and increment, which I think is ideal, yes, you need to go the route you have just described.

If you are only going volume only which is the first step on that route, you don't have to go quite that far, the permanent sample plots, the repeated measurements for volume estimate are not required and, in fact, for a volume improvement - as was explained before - you don't have to have permanent sample plots. They are a good way of getting it, but

they are not the only way of improving the volume estimate.

So, if you go volume alone and let's not worry about increment, it is not quite that time horizon. There are some changes required and volume would be an improvement.

So it is not necessarily waiting that length of time to get an improvement to the status quo.

THE CHAIRMAN: Okay.

MR. FREIDIN: Q. And when you refer to other information to supplement, other than permanent sample plots, what were you referring to?

DR. OSBORN: A. Well, we are back into an improved volumetric estimate from a variety of possible ways. We have talk of LSP, we have talked of -- we haven't talked of, we have mentioned local volume tables - that's local knowledge at the district level, and there do exist some local volume tables. These are tree volume tables, they are the sorts of tables that I used and described in the operational cruise procedure.

So there are shorter-term ways of improving the volumetric estimate without necessarily going to permanent sample plots.

Q. Would you turn to page 245 of the

witness statement, please, Document 43. And could you review that particular document, Dr. Osborn, with the Board?

A. Document 43 on page 245, as it states, it covers the central characteristics of the way Ontario actually does the maximum allowable depletion calculation. So there are some characteristics out of this table to be noted.

The first is it's calculated at the management unit level as opposed to any other piece of geography. It's not done at the district level, not done at the regional done, it's calculated at the management unit level, but that is modified by the second statement which goes on to say it is calculated within the management unit for each and every forest unit.

So within the management unit level there may well be four, five, six calculation done, one for each forest unit.

Now, I said I would explain what a forest unit was. Now, within Exhibit 7, which is the Timber Management Planning Manual, the expression forest unit is defined. In fact, there is a glossary in the back of the Timber Management Planning Manual with the forest unit term and a whole range of technical

forestry terms.

But without looking at the Manual for a moment, some of the easiest ways to think of forest unit is: Let's start off by saying it's equivalent to the working group and we've been through the working group with the FRI. So if I go to any one of the maps or the reports and say we are going talk about the jack pine working group, and you call that the forest unit, the explanations have been provided.

And so we could calculate the maximum allowable depletion for a working group. That would be perhaps the first way of a forest unit.

Now, it might be, within that working group, there is enough area and enough variability between the site classes that we may wish to split that working group, jack pine working group, into the area of site class 1 and site class 2. And each of those working group site class combinations we managed in perhaps a somewhat different way with a different rotation. So they would become two separate forest units because a forest unit is an aggregate of stands for management purposes.

And we may decide to manage the better quality jack pine in a different rotation for a different objective than that of the site class 2 jack

pine. So a forest unit may well be split by a site class determination.

Q. You mean your working group might be split?

A. And the working group might be split. We might decide, for example, to manage the poplar site class 1 for a quality veneer log and a poplar site classes 2 and 3 along with the white birch as a general intolerant hardwood bundle for pulpwood.

So here we would aggregate the poplar lower site classes with the white birch site classes. And, again, this is a managerial choice of how am I going to organize and manage my unit, given what I have got and what I am aiming for.

For each and every one of those forest units the maximum allowable depletion is calculated.

The third item was we calculated with the managerially selected rotation and we spent some time describing what the criteria for rotations could be. Within Ontario, at this point in time, the specified time period of the MAD calculation is five years. You calculate it for the next five years and you make estimates of ensuing five-year periods.

Now, the fifth criteria much has been said before, it is based on FRI data and I am going to

make reference to a previous document that is figure 29 on page 185 which describe the components of the FRI. Because within the FRI set of area, all the way from the water right down through here, the only part of that FRI data set that is in the MAD calculation is the production forested part of the FRI. We are only looking at calculating MAD on the production forest.

So out of that total FRI database, the yield regulation -- the yield calculation is based upon areas in the production forest.

If we come back to document 43 on page 245, the calculation is done on an area and age-class basis, as I will show in a moment. From that calculation, the expected volume is derived and I will show that as we do the calculation. And the calculation is done with an estimated regeneration success, whereas when we described the normal forest the regeneration success that was included there was a hundred per cent. The normal forest assumed all of the depletion would come back in as year one.

In the calculation in Ontario, we conservatively use that which we found in the past as an indicator of how much will come back. We don't put it all back in the base. So there are certain characteristics of the way in which Ontario does its

maximum allowable depletion.

Q. And when you say that only a percentage will come back, what do you mean by that? What happens to the rest of it?

A. The rest of the area in the calculation procedure will go into the FRI database, it will go into the FRI database as barren and scattered. So it will go into a working group with barren and scattered and we have explained that on FRI map sheet, but it will not re-enter the base for calculation. It is not free to grow, so it will sit in the FRI database in the calculation not going anywhere.

In real life, five years down the road, when we find what actually happened, we update and/or re-inventory to find the fate of all those actual depleted acres. Some stayed in that forest unit from whence they came, some may have moved to another forest unit, some may have stayed barren and scattered for that five-year period. So the actual fate of them is also recorded.

But in the calculation, they do not enter in, they sit in the database, but do not enter into the re-calculation for the ensuing five-year periods.

MRS. KOVEN: That is almost like a margin of safety for your growth stock.

DR. OSBORN: Yes, it is a conservative estimate. It says we don't know what is really going to happen to them, and evidence has shown that they don't disappear, we will only reintroduce them when it is proven that they have got trees back on again and they are actually growing.

So, yes, it is a conservative safety measure, if you like, in that regards.

MR. FREIDIN: Q. And, Dr. Osborn, could you just outline the approach that you are going to take to explain how the maximum allowable depletion is done in Ontario -- is actually done, just so we know we are going.

DR. OSBORN: A. Three major pieces I am trying to portray. The first is a hypothetical example, and I am going to go through the arithmetic of the mechanics of the process: What does this really mean to calculate the maximum allowable depletion and walk it through one planning period and you can see what happens to the area, you can see what happens to the volume estimates.

The second is to review some of the assumptions that were built into how we went through the arithmetic. So let's go back and let's look at: When we moved through the arithmetic, what was actually

happening, that was an assumption, and what is Ontario really doing about those assumptions? Which of those assumptions are we retaining, which are we dismissing at this point in time?

And the third step is to demonstrate that there are two major forms of modification with the simple arithmetic procedure, two major forms of modifications; one dealing with the fact the forest's age-class is not normal - it is overmature, immature - let's see what happens when we deal with that one. And, secondly, the modification caused by - a little bit of a follow-up to Mrs. Koven's question - if the areas don't come back in as free to grow, what happens to the calculation procedure.

I said in the previous diagram that only the production forest, in reality it is less than the production forest because the part of the production forest that isn't free to grow - it is young, it is barren and scattered, it is age-class 1, 2, 3, it is not yet free to grow - that part of the forest is not in the base.

So we modify the production forest by the concept of free to grow. Two changes; the age-class impact and the free to grow concept.

So there are three phases to the next

part: Calculation, set of assumptions reviewed, and the two major modifications in Ontario.

Q. All right.

MR. FREIDIN: Mr. Chairman, if I could, I could just give you the pages or paragraphs that those deal with. The first one are paragraphs 98 -- 95, I am sorry, to 99, Documents 47 -- 44 to 47.

The second area is described in paragraphs 100 to 107 and relies on Documents 48 to 51. And the last portion involves paragraphs 108 through to the end, I don't have the actual number, and involves from Documents 52 to 56.

Q. So could you go back to the first category, Dr. Osborn, which you indicated would be a hypothetical example.

Beginning at paragraph 95 and commencing with Document 44.

DR. OSBORN: A. This diagram is the initial conditions for the calculation of the area maximum allowable depletion and so over in the top right-hand corner there is a box. Within the box, for example, are some basic statistics that one would record for doing this sort of calculation: The management unit's name, test; the forest unit under consideration, demo; the time, we are at year one; the

rotation, managerially selected for this example was a hundred; the planning period in this example is 20 - although I have just given you that Ontario does it on a five-year basis in reality - but for the sake of simplification of the arithmetic, we are going to take the hundred year rotation, 20-year plan period to show what is going to happen.

The age-class histogram is something we have seen before. So we have area over age-classes, and this sort of diagram has been demonstrated when we talked about sustained yield data and when we talked about the FRI data, again, a typical way a forester will take their basic data about the unit and portray. The forest manger can learn something just by looking at the shape of the histogram.

The area on the vertical axis, the age-classes - and they are classes now, 1-20, 21-40, 41-60, 61-80, and in this example right the way up to 141-160. So we have got some old forest in here. Given a hundred year rotation, we have some old forest, they are barren and scattered, it is an area histogram, it is an area that is barren and scattered at this point in time.

So our basic time one set of conditions, and in the area calculation we are really concerned

with how much area have we got in this area row for the different age-classes. And we have, in this example, a thousand hectares and we will stay with and try and keep with forests of a thousand in this set of examples to try and simplify some comparisons.

So a thousand hectare forest, a hundred year rotation. It may be rather impractical in real life, but...

And the age-class distribution are merely the numbers that reflect the heights of the bars on the histrogram. Time one, initial conditions.

Q. The slide you now have up is page 247, Document No. 45.

A. Now, Ontario does this in a very simplistic way. In comparison with some other provinces this is incredibly simplistic, they have some elaborate methodology for doing this. In Ontario, it really is the annual yield on an area basis, is the area divided by the rotation. The area in this example is our thousand hectares and our rotation was a hundred years, and so the annual yield, annual yield would be 10 hectares.

Q. Now, just stopping you for a second. The annual yield in that formula is an annual yield for each forest unit, the calculation is made separately

for each forest unit?

A. Yes. This example, as was exemplified in the previous document, this was forest unit demo, think in management unit test.

So the maximum allowable depletion is the area over the rotation times the planning period. The maximum allowable depletion is the amount for the planning period and, in this case, our planning period was 20.

So we take our annual yield, a thousand over 10, multiply it by the number of years in the planning period, and have a number that says the maximum allowable depletion for the planning period,, which is 20 years in this case, was 200 hectares.

On page 248, Document 46 describes how out of the area calculation we can make a volumetric estimate of what we might get from those hectares. So there is an estimation of volume in the area, MAD.

We are still in the same management unit, same forest unit, we are in the time frame, years 1-20 in the first 20 years, same rotation, same planning period. How do we provide that volume estimate?

The area histrogram is still the same, this hasn't changed. The age-class line is still the same, the area at time one is still the same, our

hectares still add up to the thousand.

The next row, the third row says cut. For the sake of this example we will assume all the depletions are cut. It could be depletion -- for the site we made it cut, and we had 200 hectares that we could take in a 20-year period.

Simplistically, we want to take it from those parts of the trees that are likely to die before the planning period is over. Simplistically, we will take it from the oldest. We will come back to that a little later, but simplistically we take it from the oldest.

Now, we will come back to the cut line in a moment, but let's read the line beneath that to understand what we are going to do with the arithmetic. The fourth line in the box reads: Volume per hectare, volume per hectare. So the 21-40 we have 30 cubic metres per hectare; 41-60, 80. So the volumetric values go up, reach a maximum as you would expect, then they tend to fall off as the forest gets older and starts to break up.

So the volumetric values are not unrealistic, in fact, I could find values in the yield table to be comparable to these. And the FRI has those data, that volume per cubic -- volume per hectare data

exist in the FRI. So these exist, this volume data exists as well.

Let's come back to that cut line. We had 20 hectares in the oldest age-class, 141-160, and if we want to cut the oldest, all the 20 will be cut and if the 20 get cut with a 180 cubic metres per hectare, the total volume coming off the 141-160 age-class is the 20 times 160 or 3,200 cubic metres. We take the whole 20 hectares at 160 cubic metres per hectare, we take the oldest age-class.

Q. So the bottom line then is actually total volume?

A. Is the total volume from the period from the hectares on the age-class. 3,200 is the total volume coming off cutting the entire 20 hectares with an average of 160 cubic metres per hectare.

We have taken 20 out of our 200. The next age-class had a hundred. We will take the whole of that hundred, still the oldest age-class out there, we will take the next oldest age class, we will take all of that, and that hundred hectares in the 121-140 has an average volume of 170. If we take all of it, the total volume realized in the bottom row is 100 times 170 or 17,000 cubic metres.

So far in the cut we have taken, out of

the 200, we have taken 20, we have taken a hundred, there is 80 left because you cannot take more than 20 -- 200. So 200 less the 120, we can take 80 out of the 200 in the next oldest age class, which is the 101-120. If we take 80 hectares out of that at 200 cubic metres per hectare we will realize a volume of 16,000 cubic metres.

So the diagram says we will cut 200, that is what we said we could -- allowed to take, we will take from the oldest, we take all of the very oldest, all of the next oldest, and as much of the next oldest to make up the 200.

We will take the average volume per hectare for those age-classes and estimate, if we took all of it, what the volume might be for the three respective age-classes, sum up that volume to have some 36,200 cubic metres from the planning period from cutting the 200 hectares, FRI estimate.

So the MAD calculates the area permissible and provides an estimate of what the volume from those areas might be from the FRI database.

The last step that I want to go through is the document on page 249.

Q. One change to that document from the document which appears at page 249. The time in the

box on the right-hand corner in the document -- or page 249 says year 1-20 and it should say year 21.

MR. FREIDIN: Now, that was one of the documents that was changed in that Exhibit No. 80 that dealt with a whole series. I don't think they planned that one.

DR. OSBORN: The predicted conditions after the 20 years, which is our planning period. So from today we are making that estimate of what should we take; if we took it, what volume might we expect and now we are making the last prediction, if you like, what might the forest look like at the end of the period. So that is really why this should read year 21.

The histrogram is now changed. We will come back to the cause of the change in a moment. The same basic data, we have the age-classes, we have the data of time one, which is an exact copy of two diagrams' ago, adding up to our thousand acres with our 20 in the oldest age class, 141-160.

The third line in the box is what did we cut at 200. And, as we explained in the previous diagram, 20 in the oldest, a hundred in the next oldest, and only 80 in the third oldest. And the bottom line says what might the forest look like at

year 21. What is the age-class area distribution at age 21. Now, how do we get that?

The 141-160, we have taken all of it, the whole 20 hectares at times zero was all cut, there is none left. The 121-140 was a hundred, cut a hundred, and 20 years later, the 121-140 would become 141-160, but because we have cut all of it, there is nothing at time 21 in the box, in the 141-160 box.

The 121-140 had 200 initially. We cut 80 of it, the balance grows to be 20 years older, 121-140, we have the balance.

The 81-100 was 120, none of them were cut, they all grew to be 20-years-old, 200 initially, 61-80 moves to 200, 81-100. The 70 in the 41-60 becomes 20 years older. The 21-40 age-class group of 120 becomes 20 years older, as does the 1-20, 50 hectares becomes 21-40. How do we get 320 in the 1-20 age group in year 21?

The 120 that was barren and scattered in this example, and we have assumed had become part of the 320. The 200 that was cut, we have assumed to be regenerated. 200 and 120 gives you the 320 and we have assumed in this very simple hypothetical example that we were successful in walking the barren and scattered over the 20 years to be regenerated in the 1-20 and we

have assumed all of the 200 cut has moved into the 1-20.

MR. MARTEL: Does that occur in the first year though?

DR. OSBORN: The cut takes place --

MR. MARTEL: Or is that over of the 20-year period?

DR. OSBORN: Okay. It is the 20-year period, so the 200 get cut over the first 20 years, some of the 200 aren't cut until year 20.

So in year 21 it is just one year. All right, so it won't get all cut in the first year in the 20-year period, the 200 will get cut.

You could argue that the 120 in the barren and scattered, massive regeneration effort, they will become in here, but they are still, even then, 20 years later, they are still only in the 1-20. They are zero to start with, 20 years later they are going to be be the 20-year-olds. Because even if you made that massive effort to put more back in at year one, they are still going to be in the 1 to 20-year-old at the end of the period.

And those numbers at times 21, the area in the respective age-classes are reflected in the histrogram. And, again, the forest manager will look

at the histogram and have some understanding of what has happened to create that picture.

MR. FREIDIN: Q. Dr. Osborn, just to go back to that 320; 120 of it comes from the barren and scattered at a time what is now 20 years older?

DR. OSBORN: A. Correct.

Q. Any particular -- the other 200 you said comes from the 200 that was cut over the 20-year period?

A. Correct.

Q. You indicated that you assumed that that went into the 1-20 years for this hypothetical example?

A. Correct.

Q. If it wasn't hypothetical but was real life, would some of that 200 likely still be in the barren and scattered?

A. Yes, if it wasn't all regenerated--

Q. Right.

A. --it would in fact sit in the barren and scattered. It would still be the database, it may or may not be in this forest unit, but again staying with a hypothetical example, it seems now that we are talking about the forest unit we've used, let's assume it would stay in the database in this forest unit, it

would be recorded, we won't lose those hectares, in the barren and scattered in this very simplistic example.

Q. Now, could you explain why you took the 200 for this hypothetical example, did not put it in the barren and scattered but put it in the 1-20 age-class?

A. Because I made an assumption that all of the cut and the barren and scattered was regenerated. It was an assumption I made in going through this simplistic example. It is one of several assumptions that will be spoken to in the next four documents.

So the purpose of the three whole documents was to go through the arithmetic manipulations to get from what we start with, how we calculate the MAD, how we apply it, and how we make a volumetric estimate of what may come from such a MAD.

Q. Just one more question. In real life, if an amount was in the barren and scattered column - so let's say you had 300 in the 1-20 and you had 20 left in the barren and scattered, would the 20 come into play when you calculated your maximum allowable completion?

A. Let's make sure I understand. We have started at time 1 with 320?

Q. No, starting with 120. I am just saying, when you took the 200--

A. Yes.

Q. --total and brought it over, you assumed that it all regenerated and you put it into the 1-20?

A. Correct.

Q. If some of it did not get into the 1-20 age category but remained barren and scattered, would that have an effect on what numbers got used for your maximum allowable depletion allocation?

A. In real life?

Q. Yes.

A. Yes, but for an additional reason that hasn't been spoken to yet in this diagram. That's the whole idea of free to grow.

Q. Are we going to get to that?

A. We will get to that.

Q. Okay.

Now, looking at that hypothetical example, Dr. Osborn, were there any assumptions which had to be made or that you made in order to go through that sequence and use the numbers that you did?

A. Yes. On page 42 of the evidence, in paragraph 99. In paragraph 99 there is a list of four

sets of assumptions and they have each got headings, and those sets of assumptions are given in a little bit more detail in the Documents 48, 49, 50, and 51 on page 250 to 253.

So I would like to go through those four assumptions rather carefully. First of all, to explain what they were when they actually were applied and then speak to what is happening in real life.

So this is the overall second part of that initial -- the arithematic, the review and assumptions and the modifications. I am now into the review and the assumptions part. And this review is the sort of thing a forest manager does in real life. Having made those sorts of calculations, the forest manager goes through these assumptions and makes certain modifications in sets of analyses.

Now, the first assumption that was actually applied was that all of the maximum allowable depletion was taken. We took the entire 200 in that simplistic example. And on page 250, the first item in that diagram says: Review the cut requirement.

Q. That's at page 250?

A. Page 250.

Q. That page just deals with the first assumption of all the 200 being taken?

A. Correct. And the whole of those five items on that page - and I will go through them by one one - but the whole of the five speak to: Was that taking of the 200 realistic in real life. What do we really do? We took it in the model, should we in real life?

The first of the five says: Review the cut requirement, and typically what a forest manager will do is look at the past demands upon this unit from a timber cutting point of view: What traditionally has industry been taking from this particular forest unit, which may or may not have been all of the MAD.

And, in fact, the forest manager may in fact adjust his calculations to reflect the realization that the industry may or may not want all of that which the calculation show in conjunction with the other parts of that page, 250.

Q. Still sticking then with that first one, Dr. Osborn. In terms of cut requirements or depletions due to cutting, what factor has the greatest impact on the actual level of harvest?

A. The market. In reality, in the next five years, what actually industry demand is driven by the market for their end product. So what actually goes in the front end of the mill is really driven by

what industry says it needs.

Q. Does that fact have any effect on timber management objectives?

A. Yes, we are back to the first objective that -- the first of the set of two objectives that we spoke about right back in the beginning, and that's the maintenance and the supply to forest industry today and tomorrow.

Q. Does Dean Baskerville comment on this relationship?

A. Yes, quite explicitly.

Q. And could you refer me to the page in Exhibit No. 16 where he does that?

A. On page 14 of Exhibit 16...

THE CHAIRMAN: We do not have that one here either. Is your side, Mr. Freidin, getting together with Mr. Mander at the beginning of the day and indicating what exhibits we need out here?

MR. FREIDIN: Mr. Mander approached me and asked me what documents the Board would need for this examination, and I advised him.

I mean, I guess the word didn't get through that you would need them for the entire examination, I wasn't doing it on a day-to-day basis.

THE CHAIRMAN: I see.

MR. FREIDIN: This one paragraph, and I am going to have the witness read it, so perhaps before we get to the next portion, where it is a little bit longer, maybe we will have a break.

Q. So you were going to refer to what page of that document, please?

DR. OSBORN: A. Page 14.

Q. Yes. And what does Dean Baskerville have to say?

A. The second complete paragraph, which is quite short, reads:

"The second problem is that markets, not management plans, determine how much is actually harvested any one year. The stand is not harvested simply because the management plan says so, and only when both the management plan permit its harvest and markets require its harvest. The variability of markets from year to year is a problem, not only for rational economic development, but also a problem to the introduction of forest management. It is axiomatic that if the raw material cannot be marketed it cannot be managed."

Q. All right.

A. Cognizance of past history is an indicator of what might be in the calculation, recognizing some variability that we have discussed before.

Items 2, 3 and 4 are the three other forms of depletion that have been mentioned before. And in Ontario at the moment, as in Item No. 2 on page 250, there is a review of the history of natural losses from fire, windblow and flood as examples, but that review does not cause any change in the calculation, it doesn't change the base, but what is done is in the maximum allowable depletion calculation.

If that number is given to anybody, it is given with a realization, as in the example of 200, that if in the past, 10 of the 200 had gone up in smoke, the user is warned that traditionally out of the 200, 10 you may not reach or may not get there before nature takes it away.

So there is a degree of realism: Hey, 200 is what we will calculate but realize you will only get it if you get there before, in this case, nature does with fire. And the same is true for the review history of susceptibility to pests. If the past history shows that the budworm in fact has been taking out 5, 10 per cent of the crop, it is not used to

reduce the base or change the calculation.

Q. Now --

A. But the user is deliberately warned of the implications of such a piece of information.

Q. Now, when you say that there is no adjustment made to the calculation or to the base as a result of past history in relation to those types of depletions, does that statement hold true when you are at time one, when you are just calculating the maximum allowable depletion for a specific forest unit?

A. Yes. Right now, at the beginning of the period we are calculating the MAD, the yield regulation at the beginning, what can we expect to take in the planning period, and in that calculation starting at the beginning there is no arithmetic allowance for those factors.

Q. Now, what happens if during the first term of the plan, let's say the first five years, you have started off with your maximum allowable depletion in your hypothetical of 200 and in the middle of that five-year term there is a loss as a result of a large fire?

A. The manager will review as to the magnitude, location, implications of said fire as to what does that do to the entire forest. In this case,

the forest unit in this particular case, and what implications in terms of initial supply short-term and longevity, and one of two things will happen.

Either the loss at that time will be ignored for the planning period and the new FRI reintroduced at year five as an adjusted set of numbers, or the losses of such magnitude that at year three, the data are readjusted and a recalculation is made. So depending upon the magnitude, the location, and the age-class from whence it came, its impact, as to whether the numbers will be recalculated there and then or readjusted at the end of the planned period.

Q. If you lost a large area to fire and you waited until the end of the five-year period and you adjusted for it in the next five-year term, how would that adjustment manifest itself?

A. Well, the large fire would almost certainly take the area out of production into the barren and scattered or the non-free to grow area reducing the base, which means the ensuing MAD would almost certainly be lower than that in the previous five-year period.

Q. And if you had a change in land use, have you referred to that one yet?

A. The same sort of concept applies. In

most land use, changes are relatively small such that they get incorporated in adjustments for ensuing five-year periods. At the end of the five years we reintroduce those changes in ownership or usage and the base gets adjusted accordingly.

Now, if the land-use change was of large and/or in a location over an age-class that had a dramatic impact on the timber user, there might be a need for a recalculation. Again, a management decision depending upon magnitude, timing and location.

The last item listed on page 250 deals with whether or not all of the maximum allowable depletion is economically accessible and it is a little bit tied in with the first one. What does industry say it wants and what can industry afford to get, and afford in the broadest sense of the word.

Now, the economic accessibility at the moment is going through some real life changes and exact details of where that stands operationally I am not sure of. I am not with the day-to-day events of exactly where that is. But this is a subject that is very much changing as we define this.

Q. Could you review the second assumption that you referred to, that the harvest of that 200 hectares would come from the oldest

age-classes?

A. When we went through the example, we took the 200 hectares and I took it from the oldest age-classes and I took it with the explanation: We really tried to take those age-classes which we think will die. We have really tried to harvest those trees before nature takes them away.

So on page 251, that assumption of the oldest taken needs to be considered. There is a concept and a practice in here. The concept is to try and take the trees before they die. The practice, in simplistic terms, is to take the oldest.

Now, that has a little bit of a problem because it isn't necessarily the chronologically oldest trees that are going to die next. We may get some very old physiologically hundred year old that are going to die in the next year or so, and your 140-year-old trees are healthy and vigorous. So there is a practical problem in how you translate that concept.

In the simple example we went through we took the old defendant. So you have to review whether that really makes sense in your forest or do you have some not oldest age-classes that are on their last legs.

Now, the same applies to review of the

history in the last for things like fire and pests. In the actual practice we are going to take these numbers out when they occur. So at the end of the five-year period we actually take the actual fires, the actual pest losses, but if you ever got to think about why can't we put those in up front in the model and change the mathematics, you have to realize that fire and pests may be taking from other than the oldest age classes, fire particularly is very likely to occur, the way it occurs, spread proportionally across all age-classes. This is not what is done at the moment in the MAD in Ontario, but it is what is being done in some modeling that is going to happen in Panel 4.

So in Ontario, at the moment, the oldest is taken. This is typically a guideline for the cutting and, in fact, within the Environmental Assessment Document and the Timber Management Planning Manual there are criteria for what actually is allocated to be cut of which age is one of the criteria.

Q. And I understand that you are not going to be reviewing all of those allocation criteria in addition to or including the age?

A. No, I am just speaking at the moment to this particular assumption about oldest taken in the

model and, in actual fact, that isn't a fixed rule but is a guideline and is one of several criteria.

Q. And are you able, however, to identify the page or pages of the Timber Management Planning Manual which is Exhibit No. 7 and the Class Environmental Assessment, Exhibit No. 4, where those allocation criteria are referred to?

Perhaps you could just advise me whether my information is correct, Dr. Osborn. In the Environmental Assessment Document you will find it at page 130 and 139, the first reference being for eligibility for the 20-year term or period.

A. Yes, that is at page 130 of Exhibit 4.

Q. And page 139 deals with the five-year term of the timber management plan.

A. Yes, on page 139; that's right.

Q. And in the Timber Management Planning Manual there is a reference found at page 77?

A. Yes, page 77, talking about allocation and depletion in areas eligible for.

Q. And, again, those will be described by a later panel?

Dr. Osborn, those will be dealt with by another panel?

A. Yes, sorry. I thought it was a statement not a question.

Q. Okay. Have there been any significant changes made to the calculation of the maximum allowable depletion since Dean Baskerville did his review?

A. Yes. When Dean Baskerville did his review there was a criticism in the report that the particular procedures being followed at that time took the oldest and only the oldest in the methodology that was being followed, along the lines we described in the hypothetical example before.

Now, since that date, these particular methodology has been modified that will allow the user to go in and take from the age-classes at time one, the areas from the allocated actual age-classes, not necessarily the oldest, but from those that have been approved as an allocation.

So instead of taking all of the 141-160, the actual allocation for the criteria that we described in the TMPM may have decided to take some of those and we would have taken the balance of them maybe from other age-classes.

Q. You are using a lot of words. Perhaps as you go along, you could define them. You

talked of allocation, you talked of the TMPM.

A. If we come back to the situation trying to predict the conditions after 20 years, this really was the diagram that spoke to the cut and where did it come from. And the cut is 200 and in this diagram we took the 20 from the oldest, the hundred from the oldest, and the balance from the next oldest. Simplistic. The assumption was that we took the oldest.

This methodology now permits us that if we have decided on what areas we are actually going to cut, we can change the distribution of the 200; instead of oldest, oldest, oldest to what age-classes have we already agreed to. Maybe we will take the 20 from the 141-160, but we will only take 50 out of the 121-140 for whatever reason, we will take the 50 we are not taking out of there, maybe some out of the 101-120 and some maybe from the 81-100. Because by the time we take those the stands may well, will be 90-year-old today and be up to rotation age within the 20-year period.

Now, the actuals approved - I use the word allocation - decision on where to cut may be other than oldest, oldest, oldest. If we took it from the oldest to make life simple, the methodology has now

been changed such that you can take it from that which you decided upon and this, obviously, will impact and change the shape of what you think the forest will look like 21 years from today.

MRS. KOVEN: When did you say that changed methodology?

DR. OSBORN: When did it take place? I would estimate about a year ago. I wasn't responsible for it so I am not positive, but about a year ago they changed the particular computer model that is used in this particular calculation procedure.

MRS. KOVEN: Thank you.

MR. FREIDIN: Q. And when you referred to TMPM, you meant the Timber Management Planning Manual?

DR. OSBORN: A. Yes.

Q. Could we move then to the third assumption dealt with at page 252 that all of the area which was cut was regenerated?

A. What we are back into now is the 200 that was cut, we assumed was 200 of the 320 in here. 320 was the 120 from barren and scattered, regenerated, and we had that dialogue about the 200 in here that walked into the 1-20. So the assumption in this simplistic calculation was it was all regenerated.

As page 252 states, in real life at the moment we don't put it all back, as the first statement on page 252 states, we review the regeneration results of the forest unit back to the same forest unit and we will put back into the 1-20 that estimate based upon the past history of when we cut 200 hectares of this forest unit before, what was the regeneration success rate to the same forest unit.

We cut 200 hectares of spruce, what is the track record of getting spruce back again.

Q. And this is something that you are doing at time zero?

A. Yes. In the calculation this is done at time zero. The impact on the actual MAD for the next planning period is absolutely zero, the impact is what does the forest look like in year 21.

Q. And how do you express that regeneration that you expect?

A. The way the computer model works you express it as percentage but, as shown in here, the mathematical impact is how many hectares out of the cut walked back into the 1-20, the actual numerical number of hectares. The computer doesn't use it that way, it uses percentage value but that is just the mechanics of the computer.

Q. Are there any minimum requirements for an area to get back into the forest unit?

A. Yes, it has to be assessed and proven as free to grow for that particular forest unit.

Q. That is a concept that you have spoken of, I think, in the past?

A. Yes, I have spoken about free to grow as a concept in the past.

Q. All right. And it will be dealt with again in Panel No. 4?

A. The definition and mechanics of will be dealt with in Panel No. 4.

Q. Can you just give us a quick definition, in case we have forgotten?

A. Yes. Essentially three components. For the forest unit: Are there enough trees out there in comparison with a certain standard - we are back into the stocking, comparison with the norm - so are there enough trees out there of the acceptable species, are they tall enough and/or growing fast enough, and are they free from overhead competition.

Those are the three main ingredients without being very specific that are in the free to grow definition. Enough trees, growing fast enough, free from overhead competition.

Q. All right. What effect does the permanent roads then have on the assumption?

A. Well, in real life if we cut 200 hectares, in the cutting of that some of the area will end up in the permanent road system.

So we will cut the trees before we put the road in, but the actual road will take area out of production. We are talking of main haul roads in a timber sense, there is a loss to area by putting the road in, if it's a permanent road.

So there is a recognition that much as you might like to the whole of the 200 will not be put back in production because a piece of it will go under a road. And, as such - as the statement reads - they will go out of production forever, if it is a permanent road.

Now, the percentage in real life is quite small, but you should recognize that at least for the first rotation that is very definitely a factor to be considered. After the first rotation when the unit is accessed, that number may in fact become very small or perhaps even zero when the unit is completely accessed.

Q. And could you advise what is the effect of the third item that you have in relation to this assumption, that the model does not consider

hectares coming in from other forest units?

I assume when you are saying -- when you are saying coming in, you mean into what?

A. Into the specific forest unit that we are calculating this for. We have got forest unit, demo, and so far we have been calculating this and we have been taking hectares out for the roads and we have been taking hectares out in future base because of the regen percentage, so it has been a depletion -- a reduction exercise.

Now, in real life it is recognized that for some forest units an effort is made to bring hectares from other forest units and convert them to this particular species. We may make an effort to take a site with a species whose working group or forest unit is currently less desirable in whatever terms and convert it, literally convert it to another species.

And we talked of in site class 4 off-site species. The growth rate was reflected as being very poor because the species on the site was perhaps inappropriate. We may deliberately, as an example, take that species off and put another species on that might do a lot better. That input into this base somewhere down the road is not brought into the model, is not brought into the calculation and is another

indicator of conservatism.

MRS. KOVEN: Is this restricted to the management unit?

DR. OSBORN: This is restricted to the forest unit within the management unit. So for the jack pine, later I may convert some poplar stands to jack pine. When I do it then I will move them in. When I am calculating at the beginning, I won't presuppose, I may bring them in. I may even plan to bring them in, but until I have actually done it, I won't include it in the calculation.

MR. MARTEL: Why wouldn't you if it is in the same management unit? I mean, I could see it causing problems if you were talking about two different units, two different management units.

I think there was an allusion made some weeks ago about how it conflicted going over various boundaries, but in the sense that it is within the same management unit, why wouldn't you be prepared to move it over?

DR. OSBORN: In analysis, Mr. Martel, I definitely -- in the variety of analyses I do, the analyses, I will look at what the implications of that future plan, to do that conversion, might result in. I will do an analyses that will bring it in to look at:

If I bring it in now and if I bring it in at this size, do I really help the problem out, or do I improve the management, in analysis.

In the actual final calculation I run with, I will not put in a maybe. I will put in as much as I can what I -- that which is conservative. I will not presuppose my management will look like this in the MAD calculation for something that I would like to do but, in fact, through a variety of circumstances I may not do.

So in the actual decision I won't. In the analysis I certainly should look at: Hey, what will happen if I convert those poor sites with that species that is not growing well to something I think could do better.

Yes, in the analysis, very important, but in the actual decision of what numbers do I run with for the next five-year planning period, no, I won't introduce that into that decision at this point in time. I don't have enough confidence that 10, 15 years down the road, whoever is going to manage this area really will bring it into practice. It is a degree of conservatism within this calculation procedure.

MR. FREIDIN: Q. And does the concept of free to grow come into play when you are trying to

determine when you can get that particular area that you are trying to convert into the forest unit that you are hoping it will become?

DR. OSBORN: A. Yes, it will only go back into the base for this particular unit - even if it actually has been attempted - it will only go back in the base if it is proven free to grow.

Q. And if it is proven to be free to grow, where would it show up in relation to the document you have there which - I don't remember what exhibit that is - it is a document at page 249.

A. Yes.

THE CHAIRMAN: Yes, Document 47.

MR. FREIDIN: Document 47.

Q. What happens if it was free to grow and it did go into the forest unit, where would it occur in relation to the age-class distribution that you have referred to?

DR. OSBORN: A. In this diagram, because we have not introduced free to grow, let's presuppose that free to grow is age one, it would walk into the 1-20. What we are hypothesizing is a little bit like we did with the 120 that was already in barren and scattered in the same forest unit. We said there: Hey, let's walk that up over 20 years into here.

We are now suggesting to think about there is maybe 20, 30, 40, 50 hectares somewhere in another forest unit that we might like to convert in here and if we did, it would end up, again, future being thought of as coming into the 1-20 age-class.

So we are talking of hypothesizing what might happen, it is in the future, and at the moment the way Ontario does that, it will not do that for potential conversions which is deliberately conservative.

Q. And in the forest resources inventory, must a stand be free to grow before it can be put into an age-class other than barren and scattered?

A. Yes, the forest resources inventory has been modified - this is perhaps not the most appropriate diagram - the forest resources inventory has been modified now that the age-class that was called barren and scattered now is called barren and scattered and NSR, and that may contain barren and scattered areas as described and trees that are ages 1, 2, 3, 4, 5. They have got age, they are no longer barren and scattered, they are age 1, 2, 3, 4, 5 but they aren't free to grow.

So the FRI now has in essence split the

1-20 age group into barren and scattered and NSR and this column that is 1-20 on this diagram reads free to grow to 20.

Q. And could we move on to the fourth and last assumption that is made in your hypothetical described at page 253.

A. In the hypothetical example we made an assumption that the area that was originally in the 101-120 age-class, if it wasn't cut would become the 121-140 age-class 20 years later.

So we assumed that those hectares would just walk up an age-class, and the way the model -- the computer model is run, it presupposes that the growth rate of the trees that were 121-140 will be the way that those trees will grow if they just walked up into that age-class. It makes an assumption that the growth rates are more or less constant after the whole series of runs in this model.

Now, that needs to be considered, as evidenced on page 253, we need to think about that in relation to -- the first one says pest loss. A pest loss, particularly defoliated, typically its impact is twofold, it's mortality, it will kill trees, but before it kills them, and they still aren't dead, it will cause them to grow slower.

Now, right now in the model there is no modification for growth impacts. So although you should consider it, the model at this point in time doesn't make any allowances for modifying for those.

Q. And when you are referring to the model, what exactly is it that you are referring to?

A. There is a computer simulation routine, there is an arithmetic procedure similar to that which we went through in the overheads, but because of the actual data are in five-year age-classes, because the data numbers are much bigger and because of some assumptions and some modifications we haven't spoken to yet, the arithmetic gets a little bit more intense than that which we have gone through to aid a manager in doing these calculations, to help him or her be able to do several *iterations and analyses.

This arithmetic lent itself to computerization. So there is a computer model that let's us do something very similar to that which is described in the overheads.

Q. And we will be referring to that in a little bit more detail later?

A. Yes.

The second column in the growth part

really is a concern that has been voiced since the beginning of the description on sustained yield, is that using the past as a proxy for tomorrow, it is a proxy for tomorrow. A past growth may or may not be exactly what happens in the ensuing planning period. There is nothing much we can do it about it, but it is just a fact that we should remind users to be aware when they use this.

And the last item really is a comment that says: Given the first two, realize that on a 20-year cycle with the FRI you are going to end up with those abnormalities that we just talked about in growth at least readjusted because there will a new set of data with some new estimates of what the forest really looks like.

So the last item really brings us together to remind the user that: Okay, we have made some assumptions, we know some things are going happen in 20 years that may be different from the projection, recognize in year 20 we will try and put things to rights with a re-evaluation of the tree what's there, and that fits in with the idea of the FRI on a 20-year cycle.

MR. FREIDIN: I am just wondering whether this -- are you planning on breaking, Mr. Chairman?

THE CHAIRMAN: Yes, we are, Mr. Freidin.

All right. We will take a second break until five o'clock and then I think it is the intention of the Board to come back for approximately one further hour. We will break today around 6:00.

---Recess at 4:45 p.m.

---Upon resuming at 5:00 p.m.

THE CHAIRMAN: Thank you.

We are into the home stretch now, Mr. Freidin.

MR. FREIDIN: We actually may finish Dr. Osborn today. We certainly hope so, so does he.

MR. MARTEL: I want some--

MR. FREIDIN: Pardon me?

MR. MARTEL: --More.

MR. FREIDIN: Oh, you want some more.

I note that there are those of us who like numbers and those of us who do not.

Q. Dr. Osborn, before we get into the next area of questioning, I am going to be asking you how you use all of this information that you get when in fact you assess your assumptions to determine what reality is.

I want to go back and deal with five areas of questioning which we dealt with before just as

a means of clarification.

In relation to page 251 of the document where the oldest first assumption is reviewed, I would like to refer you to page 22 of the Baskerville report. Could you advise, do those diagrams or can those diagrams be used to explain why oldest first is not a rule but is, as you have indicated, a guideline?

DR. OSBORN: A. Yes, they can be used to explain that.

Q. And would you please give that explanation?

A. In the diagram on page 22 at the top, which is figure 4, there are three curves that describe the volume per hectare values over time, and the three curves represent the three site classes in a single working group. On the site class 1 line, as was to be expected, the volume per hectare rises faster than the two other site classes, reaches a peak somewhere in the order of age 70, 75, and then starts to fall off quite dramatically; whereas the site class 2 curve, for instance, the volume per hectare value rises slower, peaks somewhere in the order of maybe 120 years before it falls off.

Just staying with site class 1 and site class 2 for a moment. If you manage the entire working

group as a forest unit, looking at that, the trees on site class 2 areas could still be growing quite vigorously at age 100, 110 and 120 as shown on that particular diagram; whereas your site class 1 trees, once past the age of 85 are starting to really fall away.

So within that entire forest unit there could be some hundred-year-old trees on site class 1 that are really dropping out of the picture; whereas some 110 and some 120-year-old site class 2 trees are still growing very vigorously.

So this tends to exemplify that taking the oldest first in a biological sense, without some cognizance of what the actual trees are looking like in terms of growth, is somewhat dangerous and somewhat poor management.

So you need to look, as Figure 4 exemplifies, to pay attention to that, and I will come back to -- I think the words I used in the evidence was it is the physiological age of the tree and the physiological ages of the stand that we really should be concerned with: Is that stand going to fall off and die tomorrow irrespective of how chronologically old it is, is much more important than: Am I 80 years old, 90 years old and a hundred years old.

So this particular diagram on Figure 4 tends to demonstrate some actual data showing that effect.

Q. When you were referring to the assumption of all of the area of the maximum allowable depletion being cut at page 250, in relation to the first matter, review cut requirements, you referred to industry demand and you made a comment that industry will get what it needs.

Are there any assumptions that you made but which you did not state when you made that comment?

A. Yes, there are. The statement should have read: Industry will get what it needs up to the limit of the maximum allowable depletion and taking cognizance of that which it needs does not have a dramatic impact somewhere down the road on its future supply. So there are two caveats that really should have gone with the statement.

Q. At page 252, relating to the assumption that all areas regenerate, in the second matter you refer to realizing that permanent roads will go out of the production forever. Is there any other thing other than permanent roads which might result in an area going out of production forever?

A. Well, where the wood is cut and where

the wood is piled, which is really an adjacent part of the road or an expansion width in the road, is called the landing, Forest terminology. The landing is the place where the trees will often get piled to either be cut up into logs or have their branches taken off or piled just to be arranged to be loaded on the trucks. This is called a landing.

The landing is, if you like, an extension of the road and, for the sake of completion, the landing should be a part of that is taken out as well. So it really should read roads and landings.

Q. Now, in relation to page 252, and in particular the questions asked by Mr. Martel about item No. 3, if at time zero you make the assumption or you predict that you are going to be successfully converting a particular area so it will come into the forest unit, you indicated that that area does not come into the forest unit until it is free to grow; is that correct?

A. Correct.

Q. When in the life of that particular area that you are trying to reconvert might it come into the free to grow category in terms of time?

A. It might come in 1 year, 5 years, 10 years, 15, 20, years later from time zero.

Q. Any reason for using 1, 5, 10, 15 or 20 in that answer?

A. No, it could have been 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 from time zero. Some time in the future it may become free to grow in the forest unit under investigation.

Q. Is there any particular time within timber management planning that assessments are made to determine whether in fact areas are free to grow?

A. Ah. When might those data be incorporated in the base for the MAD for that forest unit, typically is at the planning period which would be, in real life, 5 years from today, 10 years from today, 15 years from today.

Q. So if at age five the area was looked at and it was still not free to grow, it would not come into the forest unit; is that correct?

A. I don't like the words age five. If five years from today, if five years from today we went to look and that converted area was not free to grow, the forest unit species, it would not be in the base of that forest unit five years from today.

Q. And one last question which is not really related to any of the assumptions.

I just want to go back to the very first

thing that you did this morning, and that was to review Exhibit 103, and you made a comment in relation to the 95-100 section in the middle of that particular exhibit and you said that 95 per cent was a common probability for resource management decisions.

And when you made that comment, what type of resource management were you referring to?

A. That in which I have some expertise which is timber.

Q. Thank you.

All right. If we can then go back to these assumptions. Can you advise, Dr. Osborn, what is done with the information or the projections related to depletion, age-classes from which the depletion will be taken, the level of regeneration on depleted areas, and the growth assumptions that you have referred to in running through the four assumptions?

A. Okay. The series of answers to those questions really are described in paragraphs 103 to 107 on page 44 of the evidence.

Q. Could you highlight for the Board the important things that are done with the data?

A. Paragraph 103 comments that those assumptions are used as input into a set of simulations, a set of estimates, predictions of what

the future forest might look like. So literally we will vary those assumptions.

For example, let's vary the assumption we take all of the MAD to we only take 75 per cent of it. In this varied assumption we regenerate all of the MAD to we only regenerate 80 per cent of it.

So those assumptions, the actual values are varied, simulations are conducted to look at the impacts on the forest short term/long term.

And so paragraph 104 talks about a number of test runs being run. And as was described before, we are essentially doing this on a computer-simulation mechanism, so the time it takes to vary any of the assumptions and do a new run, doing this by machine is relatively short in running it. It may take some time to analyze the result: What have I really got, what does this really mean?

One of the comments on paragraph 105 to perhaps stress is the growth rate running through this computer simulation, and the growth rate in this particular version of the model presupposes that the forest's growth rate of today will be echoed tomorrow.

Now, that means that there is no assumption in the model that the growth rate of today will be improved through practices in the forest today.

And paragraph 105 comments that there is nothing in that particular version of the model that let's you look at how -- what might be the impact if I stimulate the growth rate using some of the practices that were described in sustained yield.

We have talked of thinning, we have talked of arrangement of the forest that could stimulate the growth rate and, in fact, in the FRI we presented some evidence with red pine to indicate that these sorts of things were possible.

In this particular version of the model that is used in Ontario for MAD, those estimates of increased growth rate through silviculture are not included at this point in time.

And paragraph 106 rather briefly describes why and, as has been stated before, the long-term history of silviculture and its impact on growth is very short in Ontario. We do not have a lot of data or a substantial coverage of data that at this point in time we wish to put in the model that's being used to calculate the maximum allowable depletion.

That is not to say that it will not necessarily be done in the future, but at this point in time the justification is not completely supported with the sort of data inferences we have at the moment. So,

again, conservatively we have left it out of this version of the model.

Q. And what is the name of the model, the computer model?

A. I will write it first and I will speak it.

Q. I think it might have been referred to somewhere along the way, Dr. Osborn, so the Board won't be completely surprised.

A. The name of the model is OWOSFOP, O-W-O-S-F-O-P, which is an acronym for Ontario Wood Supply and Forest Productivity.

Q. I think it is already referred to on Exhibit 104.

Now, Dr. Osborn, could you advise why does the computer simulate a number of different runs, what is the reason for different simulations to be made, and perhaps you could indicate when, in relation to preparation of timber management plans, such simulations are done?

A. In terms of timing of when, we are talking right in the front of the planning period, we are talking of in time one trying to ascertain what would be the maximum allowable depletion for the five-year planning period and estimates are provided

for ensuing five-year planning periods, so it is right up at the front before action takes place.

So it is a calculation that is done to set the stage for ensuing questions like: Where do I take it from. The MAD primarily determines how much, the level, subsequent decisions based upon that ascertain from where. So timing is right in the front of the planning.

Why are these simulations done? Primarily educational and management inference. Educational in the sense that it gives forest managers an opportunity, without actually doing some practices, to estimate what might happen under a variety of circumstances. The concept of a 2 simulator is extensively used in all forms industry this day and age. You don't teach a person to fly by putting them in an airplane, you put them in a simulator it is a lot cheaper. There is a whole range of simulators. This is no different and it helps people understand and learn the environment in which they are working.

Now, in the particular context of forest management, we can look at and have some understanding of what might happen to the forest under a set of circumstances only which -- of which only one we actually execute. So you can look and see if I go too

far this way what might happen, if I go too little that way what might happen, because it is the intermingling of a whole range of functions that is going to cause the forest to change.

So the concept of simulation I think is fairly well understood. This is merely an example in a forest management context of looking at what the forest might change to under a certain set of circumstances.

It has one other benefit. If you run a series of simulations you can start to see which factors caused the greatest change, which out of those range of variables that we are manipulating, which one or which ones are having the most dramatic impact on where we are trying to get to, which are the predominant factors.

And so you can do what are called sensitivity analyses and start to see which ones really have the effect and how much effect they have. Maybe changing the rotation has a dramatic effect, whereas changing the regeneration per cent has a minor effect.

Now, the benefit of that is we can start to look at the factors that are the important ones and they are the ones that maybe we should improve our knowledge and data about and pay less attention to the ones that seem to have less effect.

With limited resources you get some key as to where your investigations and improvement of data could so from sensitivity analysis. There is a sort of third benefit that spin out of simulations.

Q. And, Mr. Armson, was the making available of this OWOSFOP model to the field, one of the actions that the Ministry set out in response to the Baskerville Audit?

MR. ARMSON: A. Yes, it was. Prior to that the unit foresters had access to it in main office, but following the Baskerville Audit it is now been -- via the micro-computers that Dr. Osborn described and the changes in the actual model itself, it is now available at the district level.

Q. Thank you. Was the type of simulation or the calculations which are inherent in this simulation done before the computer model that you have referred to was actually developed?

DR. OSBORN: A. Yes.

Q. How is it done, by hand?

A. By hand, very painfully and I speak from first-hand experience of having gone through many of those simulations in the late 1970s. And, in fact, based upon that pain and anguish was why I went and stole from New Brunswick this particular piece of

software which was modified for Ontario.

Q. Were you involved then in the development of this particular model?

A. Yes, I was one of the two people who went to New Brunswick to discuss what was in New Brunswick called the WOSFOP model and we brought it back to Ontario in actually December of 1977 and with a Dr. Raymond and I, we rewrote it and redesigned it and put the Ontario name on the front of it and it became OWOSFOP.

Q. Thank you. Now, you indicated earlier in your evidence that the third sort of area that you were going to deal with in relation to the maximum allowable depletion were two modifications to that calculation; is that correct?

A. That's correct.

Q. And perhaps you could advise the Board what are the two modifications?

A. The first modifications dealt with the fact that the age-class structure in the forest was not always -- was not typically normal it was either, the forest was typically overmature, the forest was immature or there was gaps in the age-classes so how do we deal with the existing age-class structure, did we need to worry about it and, if so, how. That was the

first modification to the basic arithmetic we have described.

And the second modification was the introduction of this concept of free to grow; that is, that it was not the entire production forest hectares that were used as the area, but only those hectares that have trees on them actually growing; i.e., they were free to grow.

Those two concepts are used today as modifications to the procedure that we described so far.

Q. And I understand that the modification, as a result of the real age-class distribution of the forest, is dealt with in Documents 52 to 54 which are found on pages 254 to 256 of the witness statement; is that correct?

A. Correct.

Q. Could you review with the Board then those particular documents to explain the significance of age-class distribution?

A. All right. On page 254 is a document that is entitled MAD Calculation Adjustments for Actual Age Class Distribution. And this particular document really points out that irrespective of the yield regulation procedure followed - whether it be

increment, whether it be volume, or whether it be area - irrespective of the major kind of methodology used, each of them has a concept of age-class adjustments incorporated in it.

Now, I have given two equations with the author of the equation, they both come from some time in the past. The increment equation is that attributable to Gerhardt, and it really says in the equation, the annual yield is made up of an increment value and an adjustment factor. And each of these equations is made up of these two parts. A normal calculation adjusted by the irregularities in the forest. This is the concept of the two diagrams -- of the diagram.

The increment value says we will average the actual CAI and the normal CAI, we will make an adjustment for the increment of the forestry not being normal, because if this is not the same as this value it will be larger or smaller than normal, and we will even make a growing stock actual and normal adjustment over a certain period, management decision.

The concept of the equation is I can calculate what I normally expect with an adjustment factor, not quite true because in here we have got an adjustment even back in the increment but the concept

is still: Let's need to adjust.

In the volumetric equation from Hundeshagen, annual yield is a normal calculation twice the growing stock, normal, divided by the rotation, which is a formula from somebody else, but we won't worry about who from at the moment.

Hundeshagen said: Let's take that equation from somebody else, which is very simple, and adjust it by the actual growing stock over the normal. If the forest has a lot more growing stock than normal, the value goes up, if the forest has a lot less growing stock than normal, the value would go down.

Q. And when you are referring to the normal growing stock would go up and/or go down and you used the word normal in the first equation as well.

What do you mean when you refer to normal?

A. We are back to the first part, we are back to the front part of this panel on sustained yield, we are back to normal, in a normal forest concept our triangle of volume. We are talking of normal, normality in this context in terms of the sustained yield forest's normal.

Q. Thank you. And just before we get down to the last part, there is a change to the

document on page 254. At the right-hand side, the equation average age, actual -- pardon me, it says average age normal on top as the numerator.

A. Yes.

Q. It should be average age actual and again that is a document which -- the changed document is part of Exhibit 80.

A. So this document makes reference to on an increment, volume and area basis the concept is a value that is based on the normal forest with an adjustment. In Ontario the area of maximum allowable depletion, we have already spoken of, the simplistic calculation is the area over the rotation.

We have been through what that was and how that was done. In reality the adjustment in Ontario says: We will adjust that by the average age of the forest, actual found in comparison with the average age of the forest normally. So, in Ontario, we adjust the area basis on a weighted average, we are actually going to weight the areas according to their age - we will see this in a moment - so we actually will adjust according to the actual conditions in the forest that normal even flow number.

So this particular diagram merely speaks to method of adjustment is similar conceptually

irrespective of the method of calculation.

Q. Just before you do that document, could you go back to the former document, the last equation says AD equals area over rotation.

What does the AD stand for?

A. Annual depletion. That is how maximum allowable depletion is being calculated.

Q. Okay.

A. Before I describe what happens arithmetically, I just wanted to reinforce the concept.

We talked about MAD as area divided by rotation, we worked out a value of 200, and we could have run that right the way through for a whole rotation.

But as was explained in sustained yield, we potentially run some risks. If the forest was very overmature we might lose some of it, if the forest was very immature we might calculate a value that in fact could not be taken because the trees were too small. So conceptually the structure of the forest may cause us to think whether that is simplistic area over rotation needs to be modified.

The previous document showed that that is typically the case. So this is what we are trying to, is show how that modification is applied.

This diagram goes through the arithmetic of how to calculate something called the weighted average age. This is not just an average age it is weighted, it is weighted by the area in each age-class. Again we have another statistical term.

Q. And before you deal with that, there is a change on this document as well under the right-hand column sum, the second last one should read 50,000 not 5,000 as indicated on page 255.

A. This is a chart that is laid out in similar fashion to that which we have seen with the histograms. So we have age-classes across the top and we have a total area, and our total area under Total is the same a thousand hectares that we had in our previous simple example.

And, in fact, the last row in that table, Overmature, the numbers in that overmature forest are exactly the same numbers that were used in our thousand hectare simple forest that we have done through the arithematic.

Q. And when we are talking about the total here, again we are talking about the total area of the forest unit?

A. The total area of this forest unit, yes. This is done on a forest unit basis the MAD, and

the sum in the final column is the sum of the area in each, times the average age of that particular column.

Now, the average age, the class average, let's go into the 1-20. The average age of the 1-20 age-class is 10 years old. The average age of the 21-40 is 30 years old. We are picking the midpoint of the age class. And to calculate what this sum is about, we are going to calculate the sum of 0 times 50, plus 10 times 210, plus 30 times 240, plus 50 times 260 and so on right the way across multiplying the average age of the age-class times the area in the age-class.

Now, a summation of all those modifications ends up to the value that is over in the right-hand column, 40,500.

If we do the same for the normal forest, normal forest we took our thousand acres, if it was normal, and we have a hundred year rotation - same as the simple example before, we haven't changed that - we should have 200, 200, 200, 200, 200, in each of the five-year age classes that make up the hundred year spread.

And, again, if we multiply the midpoint, mid-age times the area, plus the midpoint times the area, and we summate that, we will end up with 50,000. And normal forest summation, in this case, of hectares

times midpoint will end up with 50,000.

The procedure is repeated aritmetically for the overmature, we end up with a value in the summation of 70,400.

Let's take the normal forest. We have a normal forest on a hundred year rotation, the area is equally distributed across the whole hundred years, the average age - if we had one hectare of every age group - the average on a hundred year rotation would be 50, that's the average age of the entire forest. We have got from 1-100, the average of that range of numbers is 50. The average age for our normal forest is 50 years for the hundred year rotation.

If we took the sum of these values and it was divided up by the total value area to end up with the average age of the normal forest is 50. This is a weighted average arithmetic procedure.

If we look at our immature forest, heavy number of hectares in the young age-classes, very little, if any, in excess of rotation age, it is not very surprising logically that the average age is less than 50.

If we took that summation figure, taking the midpoint age-class times the area and summating it, that summation figure and divide it again by the total

area and we end up with 40.5.

And with the overmature forest, again not surprising, we end up with an average age that is higher than normal. This is the first step in that adjustment because we need to divide the actual average age by the normal. This is how we derive the actual average age.

In this case we actually - because we have got the normal forest in the list - produced the normal average age as well.

On page 256 --

Q. And there are a number of changes in this document. In B), if you go over to the extreme right it should be 10, not 8.1, and if you go back to the red dot, to the left of that on this diagram, it should be 50 as the nominator not 40.5.

If you go down to the next one for over mature, the right-hand column should be 14.08 hectares not 8.1, and to the left of that it should be 70.4 not 40.5. It's Exhibit 80 containing the changed document.

A. In this document let's remind ourselves that the maximum allowable depletion on an area basis and on an annual basis -- sorry, on an annual basis is made up of two parts. The normal part in green, which is highlighted, the normal part of the

calculation with an adjustment factor. So that's the concept we have in this diagram.

Q. The green part, again, of this particular document refers to the area over rotation part of the equation and the first set of -- the first fraction which appears in each of the calculations which follow A), B) and C).

A. So in the immature forest, our area over rotation, we had a thousand hectares, we had a hundred year rotation. Our adjustment factor, the actual average age over the normal average age. We just calculated it. The actual average age of the immature forest was 40.5, that weighted average age for that young forest, and the normal average age for the forest was 50.

Now, the 40.5 over 50 will cause an arithematic reduction to the normal a thousand divided by the hundred. As the forest is younger in average age it won't reduce the maximum allowable depletion less than the 10 that was the normal.

We look at B), which is the normal calculation, we have an area of a thousand divided by rotation of a hundred, that's our 10, modified by the actual average age over the normal, which in this case is one, so we have our 10 where we had that original

simplistic calculation.

This is the version the B) normal forest, with no adjustments for age because the forest is normal. The overmature has, again, the normal at the front, a thousand over a hundred calculation, multiplied by the average age effect, leading to a larger than normal MAD.

The arithematic is fairly straightforward. The concept is if the forest is overmature you potentially speed it up before you lose it, if the forest is immature you decelerate the allowable cut until the forest reaches a size that is economically harvested.

Q. And in the example where you have the overmature where you a total number of hectares greater than the area in the normal situation, if you actually go out and you cut that larger area, what is the term which is used to describe that cutting?

A. It is accelerated cutting, accelerated in comparison to what you normally would cut.

Q. And in the example A) where you actually go out and let's assume you actually cut all of the 8.1, again which is less than normal area of 10, what do you call that?

A. You have decelerated cutting.

Q. Thank you. Now, the next series of documents, Documents 55 and 56, are documents, are they not, which explain -- which you are going to use to explain the second modification to the maximim allowable depletion calculation and that one being as a result of the concept of free to grow?

A. That's correct.

Q. Can you take the Board through those two in a similar fashion?

A. This is the last two sets of diagrams.

And, again, before I go through the arithmetic, the concept is to realize, whereas in the past the area that went into the calculation was the area of the forest unit in the production forest, the entire area. This had some criticisms and it has ran some risks in doing that because there are some assumptions that all these things will grow which is not necessarily the case.

So what happened is back in actually 1979-1980, a concept that really came from the west coast, that Mr. Armson and I stole from, in this case Oregon I think, the concept of free to grow was introduced into Ontario of: Let's just put in the

calculation base those hectares proven with trees that are growing.

And although free to grow words really came from trees tall enough so that deer couldn't eat them from the west coast, the concept was still applicable in Ontario. The trees are there and they are growing. And let's use that hectarage as the base for the calculations.

So the areas that are not free to grow, still in that forest unit, are in barren and scattered or young age-classes but they are either there is not enough of them or they are not growing fast enough. they still have got competition, we will keep them in the inventory but they are not in the base for the MAD.

So this is the concept: Let's just put in there a basis that is out there and growing.

On page 257, this Document 55, describes the arithmetic of what this means. 257 is rather monumental, we have implications of free to grow in the area base MAD calculations, this is what this is trying to demonstrate.

We have age-classes, we have some additional columns, the total area free to grow, the sum of the area times the average age - these are two columns we have seen from before - the column of the

forest unit's average age, and last, we have the ratio of actual versus normal.

Now, the first two rows in this diagram are a repeat of diagrams we have seen before. The first with one no free to grow concept is a normal forest 200 hectares in each of the age-classes up to rotation age. The total was a thousand, the sum of the area times its average age was the 50,000 we described before, forest average age was 50, we have seen before and the ratio of actual to normal is 50 to 50, which is one. We have been through the first row before.

The second row was our overmature forest. Again, we have seen before with no free to grow concept included. So the age-class distribution we have had before, same thousand hectares, same sum, same average age, and a ratio of .41, taking 70.4 in comparison with 50. Again, we have been through this before.

Let's bring in the concept of free to grow and let's bring the concept of free to grow in as if it has impact at age 20. Things up to age 20 in the forest unit we will assume are not free to grow. We are going to make the decision that we have found in the past that free to grow is reached when the trees are approximately 20 years old.

So in the modeling you make some

assumptions that things less than age 20 at the moment will not be free to grow. So our free to grow barrier is at the end of the 1-20 age group.

Now, what does that do to the arithmetic. In our normal forest we had 200 hectares of 1-20, it is no longer free to grow, and so when we come and look under total free to grow instead of a thousand, we now only have 800.

If we go through the calculations of area times average age, instead of 50,000 we end up at 48,000. We are missing 200 times 10, 2,000, hence 50,000 down to 48,000.

If we go through the average age calculations the same way we end up with average age now 60, because the average age from 20 to a hundred -- the average from 20 to a hundred is 60. It goes to the normal of 50.

What does it do to our overmature forest. We have 120 sitting in barren and scattered, we have 50 sitting in 1-20. If we go through the same calculations, we have got 170 that are not free to grow in here, 120 plus 50, so our total free to grow is a thousand less the 170 or 830.

The same arithmetic for average age in terms of sum of area times average age, average age

calculation, the ratio of the average age to normal for the free to grow concept is 1.41, 1.42 as opposed to what it was before. For our forest, by introducing the free to grow concept, we haven't actually changed what the values are in this particular instance.

Okay. Now, what --

Q. In the overmature at the right-hand column my Document 55 says 1.40.

A. 1.40. Sorry, I can't see through the covering. Yes, 1.40, I am sorry. There is a slight change from what it was when the free to grow concept was introduced.

What really happens when we have the impact of free to grow is profound, what happens when we take this overmature forest and we decide that there really is a large area that is not free to grow. Does that have any impact?

So we have changed the example. We have still got a thousand hectare forest, but I have taken some of the hectares from this end and I have put them into a large area in the 1-20 that is not free to grow. So I have got a forest here, my thousand acres, in this case there is a large area that hasn't yet been proven free to grow and if you go through the process, same process, we add up the hectares we have only got 530 in

total free to grow this time, go through the sum, area times average age, go through what the average age is, go through the ratio, we end up with an answer and the bottom line is on page 258, because the arithmetic mechanics is done by the computer.

And this last diagram is the arithmetic of maximum allowable depletion with area age-class adjustments and implications of free to grow. So we now have embraced both: How do we take the age into account and how do we incorporate the free to grow concept and we put both those two adjustments into a bundle.

And there is two equations. The first equation labeled No. 1 says: Let's not have free to grow, let's forget that concept and in which case the calculation is the area over rotation with the adjustment for age. We have been through that and we have explained that.

The second says: Let's bring in the concept of free to grow we have just gone through and this changes the actual formula. The area is now the area that is free to grow. This is the concept we are trying to introduce. The area in the production forest now is reduced to that area that actually is free to grow, that is the area.

The divisor is no longer just the rotation the divisor is the rotation minus the age we think stands will be free to grow. We need to change the divisor to keep the concept of a normal forest.

The adjustment is the actual average age over the normal average age, same sort of adjustment in both cases and what happens to the arithmetic what happens to the answers when we apply with or without free to grow.

Equation answer 1A) the normal maximum allowable depletion, no free to grow concept, normal, we had a thousand over a hundred, with our actual average age over normal average age for our normal forest we had an answer of 10. This is the number that we have been chasing all the way through this afternoon.

The overmature with no free to grow, the overmature MAD, a thousand over a hundred with the average age adjustment, and we have our answer of 14.08 which we have seen before.

What happens when we bring in free to grow. Equation No. 2 brings in free to grow. 2A, what happens to our normal forest. The area free to grow was 800 and the rotation minus the free to grow was 100 minus 20 or 80. The adjustment was the actual average

age over the normal average age and the answer comes out to be the same.

So the normal forest, the overall theory behind this is unaffected by introducing the concept of free to grow. Equation 2A) produces the same arithmetic answer as 1A). We have not disturbed that idea of a long-term drive to have a normal forest by adding this modification.

That long-term intent of where we were striving for, that long elaboration in sustained yield is still inherently behind this calculation with this adjustment.

What happens to our overmature forest. And without free to grow the overmature forest shows a value of 14.08. If we introduce free to grow we have overmature forest, we have a change in the area, it is 800 instead of a thousand, as a given in the last diagram, and the divisor is the 80, rotation less the age of free to grow, we have the acceleration factor in this case because the forest is overmature and we have a forest where the answer now is 14.56.

With the free to grow concept the overmature forest may give rise to faster the width with the free to grow concept. The overmature forest with the free to grow concept, sorry, may give rise to

an answer that is slightly larger than the without the free to grow concept.

What happened however to our rather serious situation with a large area that wasn't free to grow at all, what happened to the forest where there was a large backlog of areas not free to grow.

There is a large area in the 1-20 that wasn't free to grow. And if we go through the same arithmetic of that one, which is the last example, 2C), the arithmetic comes out and says: The MAD is quite reduced in comparison with the forest that was overmature which it closely resembles.

So by having that rather large area non-free to grow, there is quite a reduction to the MAD with the free to grow concept. So the effect of free to grow concept works arithmetically. If you don't have a lot of it regenerated - surprise, surprise - the MAD will get reduced on you.

MR. FREIDIN: Mr. Chairman, I think that I have got about five more questions. I think I can probably finish by 6:15 if I might continue.

THE CHAIRMAN: Okay, let's finish off.

MR. FREIDIN: Q. Could you advise, is there any practical significance to the fact that where you have an immature forest, that number as you have

indicated by Document 56, that it is lower than the amount that you would have if it was an overmature forest?

A. The fact the immature forest's MAD is lower than normal is an arithmetic continuation of what was described in sustained yield. If the forest is immature, calculating the MAD at the normal level, you may end up with an estimated value that tells you that you can cut, but the trees in fact are not big enough to actually be harvestable and/or sustainable and you potentially cut into that growth rate of that young forest.

So we explained that in the sustained yield part, and arithmetic of yield regulation is the sort of arithmetic that sort of corroborates that.

Q. And if somebody who was managing the resource wanted to increase the maximum allowable depletion in a situation where you had an immature forest, is there any action that they could take to in fact increase that area of maximum allowable depletion?

A. Well, you could certainly make effort to move the area into the free to grow, in the young forest, you could move areas into the base to increase the maximum allowable depletion.

The second is, we talked about

silvicultural stimulation to make the trees grow faster which would either adjust the growth rate or make the trees appear at age 50 as if they were 60-year-olds. Now, the net effect in the calculation is you change the rotation; all of sudden instead of dividing by 60 you divide by 50 and the numbers go up.

So the rotation is another factor that can be adjusted, given that you can do something that warrants that change.

Q. And in when you were discussing Document 55 and 56, and you referred to -- in particular, if you go back to 55, you refer to free to grow starting at age 20, was that age chosen for the purpose of the demonstration as opposed to it being a depiction of what actually occurs?

A. The purpose of the demonstration, we have got this simple calculation of 20-year age-classes in real life we are in fives, which would have made the arithmetic much more laborious than it already was, so it was picked as a purely hypothetical value to fit into the age-classes we were using in the example. In real life, the value can be quite different from 20.

Q. And in relation to the adjustment for free to grow, in your earlier evidence you referred to the criteria of free to grow also being used to update

the inventory between say the 20-year intervals where you actually go out and fly and produce a forest resources inventory.

Do you recall that?

A. Yes.

Q. Does Dean Baskerville comment on the Ministry's use of this concept free to grow?

A. Yes, he does.

Q. And could you refer to Exhibit 16, and I refer you to page 1 of that document, and does he comment on that at page 16?

A. Yes.

Q. And could you indicate where?

A. Okay. On page 16, in the first paragraph -- the first full paragraph, the second half of that paragraph sort of starts from the sentence talking about stands:

"Those that are satisfactorily stocked are then accessed for free-to-grow status. Stands that pass both the stocking and free-to-grow assessments are returned to the MAD base and those that do not qualify remain out of the base until natural development over time, or the results of treatment, qualify them

for entry."

Q. And the next sentence, the next paragraph?

A. Oh, it says:

"The bookkeeping for this area system is already in place."

Q. And did he do any spot checks as to whether that free to grow concept was being used properly?

A. Yes. According to this report, he did do some spots checks on individual stands to assess whether or not in fact they have been classified correctly and entered into the base appropriately.

Q. Does he make a comment in relation to the use of free to grow at page 47 of the report?

A. Yes. The top of page 47, talking partly about some conversions, but says:

"The silvicultural approach in the cases examined is very much oriented to maintaining the same working group distribution as the natural forest."

He says:

"There are few attempts to convert, and only then where the original working group does not make effective use of the

site, as with balsam fir."

This is talking about conversions.

He goes on to say:

"The stocking assessment and free-to-grow assessment procedures are well-designed, and provide a good base for re-entry of a stand to the MAD base."

So this is talking about conversion or where it does take place, actually, and is assessed as free to grow, then it walks back into the forest unit base for the calculation and that bookkeeping process is in order.

Q. In paragraph 117 of the witness statement, at page 47 of the witness statement, the first sentence says:

"Finally..."

Sorry, page 47 of the witness statement.

A. Yes.

Q. The first sentence says:

"Finally it is important to note that in Ontario there is a common procedure for doing these calculations."

And could you advise me why having a common procedure for doing these calculations is important?

A. I suppose really for three main purposes that spring to mind.

The first is for the person doing it to be trained and understand what the yield regulation procedures are and why they are done this way and how they are done. That educational familiarity with a process is helpful.

If you chop and change and keep giving them 10 or 11 you add to the confusion. So there is an educational on the user part on the person doing the calculation.

And the second main purpose is an education on the receiver part. Let's make sure the person who is being given the answer to the MAD understands what is being done and how. Again, a common way, a standard way of having this processed helps the recipient understand what it is they are being given in the explanation.

And in conjunction I suppose with the second is the third one, in a way it helps the people who are interested in the overall process and, in this case, that is sort of opening the door to the general public that if the procedure is described documented and stays the same, eventually there is a learning from the public as to what are we doing, how are we doing

it, and it is being done in a fairly standardized fashion.

Q. And my last question is: Does Dean Baskerville comment on the Ministry of Natural Resources' choice of the area approach to yield regulation and its application?

A. Yes. Pages 14, and I suppose the top of page 15 in Exhibit 16.

Q. And where do we start in relation -- on page 14.

A. Really the last paragraph.

Q. All right.

A. The paragraph that starts: "Volume regulation...."

Q. And could you read the two paragraphs or the -- yes, the two paragraphs that you refer to.

A. The page 14 reads:

"Volume regulation could greatly reduce the problems with respect to even flow and market variations, but would bring insurmountable problems in terms of dealing with the myriad reductions to the land base to protect non-timber values. While no form of regulation is without its problem in a specific case, the use

of an area regulation in the Ontario Crown forests is entirely appropriate as a means of determining maximum allowable depletion. Given the form and nature of the substantial constraints imposed on the production base for timber management by non-timber values, an area approach is more reasonable than use of volume regulation."

Page 15 read:

"The application of area regulation by the OMNR is appropriate to the situation and soundly applied. Subsequent sections of this report will demonstrate, however, that there is insufficient link from area regulation to measures of forest produce, particularly volume. The absence of this area-volume connection is damaging to the evaluation of objectives at all levels of planning in the OMNR."

Q. And I understand your evidence has already referred to methods by which the Ministry could produce more reliable volume estimates?

A. Yes.

MR. FREIDIN: Thank you. Those are my

questions of Dr. Osborn.

THE CHAIRMAN: Thank you, Mr. Freidin.

Very well, ladies and gentlemen, we will adjourn for the day until 9:30a.m. tomorrow morning.

And just before we go, Mr. Freidin, what happens now, do we go to Mr. Armson?

MR. FREIDIN: Go to Mr. Armson. I think we will probably be finished before the luncheon break. This panel would be completed before the luncheon break.

THE CHAIRMAN: And ready for cross-examination?

MR. FREIDIN: Correct.

THE CHAIRMAN: What about the Association? Are you going to be asking any questions of this panel before cross-examination?

MR. TUER: Well, I sort of look on my function as one of cross-examination but, yes, I will be asking questions.

THE CHAIRMAN: Very well.

Mr. Castrilli, are you going to be ready tomorrow afternoon to start in?

MR. CASTRILLI: Yes, I will be.

THE CHAIRMAN: Thank you.

Very well, ladies and gentlemen, we will

adjourn for the night.

---Whereupon the hearing adjourned at 6:15 p.m., to reconvene on Tuesday, July 5th, 1988, commencing at 9:30 a.m.

E R R A T A

Volume XXII

Page 3687, line 21.
For: "...the toll on hardwoods", please read:
"...the intolerant hardwoods..."